

# **City of Charlotte NPDES MS4 Permit Program**

## **Stormwater Management Program Plan**

**FY2016 Annual Report**



**Permit Number NCS000240**

**September 2016**

## *Table of Contents*

<b>Section 1</b>	<b>Introduction.....</b>	<b>1</b>
<b>Section 2</b>	<b>Background Information .....</b>	<b>3</b>
<b>Section 3</b>	<b>Public Education and Outreach Program .....</b>	<b>8</b>
<b>Section 4</b>	<b>Public Involvement and Participation Program .....</b>	<b>21</b>
<b>Section 5</b>	<b>Illicit Discharge Detection and Elimination Program .....</b>	<b>30</b>
<b>Section 6</b>	<b>Construction Site Stormwater Runoff Control Program.....</b>	<b>54</b>
<b>Section 7</b>	<b>Post-Construction Stormwater Management Program .....</b>	<b>61</b>
<b>Section 8</b>	<b>Pollution Prevention/Good Housekeeping Program.....</b>	<b>67</b>
<b>Section 9</b>	<b>Industrial Facilities Evaluation and Monitoring Program .....</b>	<b>84</b>
<b>Section 10</b>	<b>Water Quality Assessment and Monitoring Program.....</b>	<b>95</b>
<b>Section 11</b>	<b>Total Maximum Daily Load (TMDL) Program.....</b>	<b>111</b>
<b>Appendix A</b>	<b>TMDL Watershed Plan .....</b>	<b>123</b>
<b>Appendix B</b>	<b>TMDL Watershed Monitoring Plan.....</b>	<b>175</b>

### **Acronyms Used In This Document:**

BMP:	Best Management Practice
BOD:	Biochemical Oxygen Demand
CATS:	Charlotte Area Transit System
CDOT:	Charlotte Department of Transportation
CFD:	Charlotte Fire Department
CFR:	Code of Federal Regulations
CLT:	Charlotte
CMANN:	Continuous Monitoring Alert Notification Network
CMCSI:	Charlotte-Mecklenburg Certified Site Inspector
CMGC:	Charlotte-Mecklenburg Government Center
CMPD:	Charlotte-Mecklenburg Police Department
CMS:	Charlotte-Mecklenburg Schools
CMSWS:	Charlotte-Mecklenburg Storm Water Services
CPCC:	Central Piedmont Community College
CWA:	Clean Water Act

DEMLR:	Division of Energy, Mining, and Land Resources
DO:	Dissolved Oxygen
DWF:	Dry Weather Flow
DWQ:	Division of Water Quality
DWR:	Division of Water Resources
EPM-SWS:	Engineering and Property Management Dept.-Storm Water Services Division
ETJ:	Extra Territorial Jurisdiction
FY:	Fiscal Year
GIS:	Geographic Information System
GPS:	Global Positioning System
IDDE:	Illicit Discharge Detection and Elimination
IDEP:	Illicit Discharge Elimination Program
MEP:	Maximum Extent Practicable
MS4:	Municipal Separate Storm Sewer System
NCAC:	North Carolina Administrative Code
NCDEQ:	North Carolina Department of Environmental Quality
NCGA:	North Carolina General Assembly
NOV:	Notice of Violation
NPDES:	National Pollutant Discharge Elimination System
O&M:	Operation & Maintenance
PCSM:	Post-Construction Stormwater Management Program
PCSO:	Post-Construction Stormwater Ordinance
QA/QC:	Quality Assurance/Quality Control Program
SAP:	Standard Administrative Procedure
SARA:	Superfund Amendments and Reauthorization Act
SCM:	Structural Control Measure
SOP:	Standard Operating Procedure
SSO:	Sanitary Sewer Overflow
SWAC:	Storm Water Advisory Committee
SWIM:	Surface Water Improvement and Management
SWMP:	Stormwater Management Program Plan
SWPPP:	Stormwater Pollution Prevention Plan
TMDL:	Total Maximum Daily Load
TN:	Total Nitrogen
TP:	Total Phosphorus
TSS:	Total Suspended Solids
UNCC:	University of North Carolina at Charlotte
USEPA:	United States Environmental Protection Agency
USGS:	United States Geological Survey
WLA:	Waste Load Allocation
WQ:	Water Quality
WQS:	Water Quality Standards
WSWS:	Water Supply Watershed
WTP:	Water Treatment Plant
WWTP:	Wastewater Treatment Plant

## **Section 1: Introduction**

On November 1, 1993, the City of Charlotte began operating under National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit Number NCS000240. This permit has subsequently been renewed for a five-year permit term on three occasions and is currently in its 4<sup>th</sup> permit cycle effective March 1, 2013 through February 28, 2018.

This document provides the Annual Report for the Stormwater Management Program Plan (SWMP) for FY2016 under the current permit term as required by Part III, paragraph 2 of the NPDES MS4 permit. The overall objective of this Annual Report is to document activities conducted in support of the SWMP during FY2016 (July 1, 2015 to June 30, 2016) and discuss future proposed program activities and/or SWMP changes as necessary. The City of Charlotte-Engineering and Property Management Department-Storm Water Services Division (EPM-SWS) is the primary agency responsible for managing the City's NPDES MS4 permit, the MS4 system and the SWMP. The implementation of the requirements within the permit program and SWMP are coordinated with other applicable City departments as necessary. In addition, coordination is conducted with the NPDES Phase II MS4 permit programs for the jurisdictions in Mecklenburg County adjacent to the City of Charlotte where appropriate and feasible. This coordination is conducted to help ensure uniformity between the Phase I and Phase II local NPDES MS4 stormwater permit programs and jurisdictions. Mecklenburg County stormwater staff along with EPM-SWS staff collectively form Charlotte-Mecklenburg Storm Water Services (CMSWS), a joint City/County utility focused on providing service to City and County residents.

Included in this SWMP Annual Report are a listing of the individual best management practices (BMPs) that are being used to fulfill program requirements along with the corresponding frequency and status of each BMP, measurable program goals and planned future activities, implementation schedule, funding sources, and responsible positions. In addition, an assessment of program activities conducted during the reporting year is completed for each core permit program.

Staff of EPM-SWS, under the direction of the City's Water Quality Program Manager, is responsible for the fulfillment of most of the activities discussed in this SWMP. Exceptions to this include the City's Engineering and Property Management Department-Land Development Division, which is the primary agency responsible for the Development and Redevelopment Plan Review and Construction Site Stormwater Runoff Control programs within the SWMP. In addition, the City's Department of Transportation-Street Maintenance Division and Solid Waste Services Department have responsibility for routine maintenance of certain portions of the MS4, in coordination with EPM-SWS.

The City's SWMP includes the following core Phase I permit programs:

1. Public Education and Outreach Program – This program provides the general public as well as business and industry with valuable information on general water quality, pollution prevention, and reporting problems, as well as specialized information on various activities



that have the potential to cause pollution and harm water quality. This information is provided using a wide range of media including print, radio, television, and social media.

2. Public Involvement and Participation Program – This program provides the general public as well as business and industry the opportunity to participate in various programs within the City’s SWMP. Charlotte-Mecklenburg government maintains a Storm Water Advisory Committee (SWAC), which is an appointed citizen panel to review and comment on the City’s and County’s stormwater programs. In addition, public volunteer opportunities are available with City/County programs such as Storm Drain Marking.
3. Illicit Discharge Detection and Elimination Program – This program is designed to protect water quality by detecting and eliminating pollution sources from illicit connections such as improper sewage or wastewater connections; illegal discharges such as chemical, paint, or oil dumping; and spills such as sewer overflows or vehicle accidents involving discharges of fuel, oil, and other chemicals. As part of this program, the City enforces the “City of Charlotte - Stormwater Pollution Control Ordinance”, which prohibits the discharge of pollutants to the storm drain system and receiving streams. The City relies on reports from the public, various monitoring programs, and a wide range of other activities to assist in identifying and eliminating these sources of pollution.
4. Construction Site Stormwater Runoff Control Program – The City maintains a delegated local erosion and sediment control program to control sediments and other pollutants from construction sites. As part of this, the program enforces the “City of Charlotte - Soil Erosion and Sedimentation Control Ordinance”, which requires proper erosion control on project sites. The City conducts routine inspections of construction sites and issues violation notices and fines when necessary to ensure compliance with the ordinance.
5. Post-Construction Stormwater Management Program – The City maintains a program to control the discharge of pollutants in stormwater runoff from new development and redevelopment projects. As part of this, the program enforces the “City of Charlotte – Post-Construction Stormwater Ordinance”, which requires structural stormwater controls for applicable new development and redevelopment projects as defined in the ordinance. The program involves review and approval of project plans as well as site inspections and maintenance activities to ensure that treatment practices are properly operated and maintained.
6. Pollution Prevention/Good Housekeeping Program – This program focuses on ensuring that City facilities and field operations are managed in a way that minimizes stormwater pollutant discharges. Stormwater Pollution Prevention Plans and Spill Response Plans are prepared for applicable facilities that conduct activities with the potential for stormwater pollutant discharges. The City conducts annual inspections and training sessions at these facilities to ensure that requirements are being met. Field operations are evaluated for impacts on stormwater quality and best management practices are developed and implemented in order to minimize those impacts.

7. Industrial Facilities Evaluation and Monitoring Program – This program focuses on industrial facilities that discharge stormwater to the City’s MS4 and receiving streams. Inspections are conducted at these facilities on a rotational basis to review site operations and materials handling practices. In addition, if the facility has a stormwater permit, it is reviewed to ensure that permit conditions are adhered to.
8. Water Quality Assessment and Monitoring Program – The City maintains a water quality monitoring program and plan designed to monitor major streams to determine water quality conditions and assist in evaluating the effectiveness of various stormwater management programs. The program also is used to assist in locating illicit discharges and connections where possible.
9. Total Maximum Daily Load (TMDL) Program – The Total Maximum Daily Load (TMDL) program is required by the Clean Water Act and is a plan developed by the State or USEPA that is designed to address pollutants causing impairments to water bodies. The City’s NPDES MS4 permit requires that if the City is or becomes subject to an approved TMDL with an approved Waste Load Allocation (WLA) assigned to stormwater, then BMPs will be developed and implemented within the six minimum permit measures that are designed to reduce the TMDL pollutant of concern within the Permittee’s assigned MS4 NPDES regulated waste load allocation to the maximum extent practicable (MEP), and to the extent authorized by law.

## **Section 2: Background Information**

### **2.1 Population Served**

The SWMP covers the jurisdictional area, including the incorporated area and extra territorial jurisdiction (ETJ), for the City of Charlotte, as applicable and defined for the permit programs in the NPDES MS4 permit.

**Table 2-1** provides the population for the City of Charlotte based on the 2000 and 2010 US census. This census data was obtained from the following website of the US Census Bureau:

<http://quickfacts.census.gov/qfd/states/37/3712000.html>

**Table 2-1:** Population and Growth Rate for the City of Charlotte.

2015 Population (est.)	2010 Population	2000 Population	Average Annual Percent Change (2000-2010)
827,097	731,424	540,828	3.5%

## 2.2 Growth Rate

**Table 2-1** shows the population growth rate represented as an “Average Annual Percent Change” for the City of Charlotte. This growth rate was calculated by dividing the overall percent change between the 2000 and 2010 Census by the 10-year interval.

## 2.3 Jurisdictional and MS4 Service Areas

The jurisdictional and MS4 service area for the City is provided in **Table 2-2**. The location of this area within Mecklenburg County and corresponding watershed areas are provided in **Figure 2-1**. The source of this information is the City of Charlotte Planning Department, which updates jurisdictional and geographical boundaries as annexations occur.

**Table 2-2:** Jurisdictional and MS4 Service Area for the City of Charlotte.

Incorporated Area (Sq. Miles)	ETJ (Sq. Miles)	Total Jurisdiction (Sq. Miles)
307	69	376

## 2.4 MS4 Conveyance System

The existing MS4 service area and conveyance system is located within the City of Charlotte corporate limits and is composed of curbs, gutters, catch basins, culverts, pipes, ditches, and outfalls that collect and convey stormwater for discharge to receiving streams. Based on current MS4 inventory within the corporate limits, there are an estimated 2,061 miles of storm drain pipe, 98,512 catch basins and drop inlets, and 5,628 outfalls within the City’s MS4. At a minimum, pipe systems are typically 15-inches in diameter and are designed for the 10-year storm event. Outlet energy is commonly dissipated through the use of end-walls or flared end sections with riprap aprons. Although the natural alignment of many receiving streams has been altered over the past century, many of the stream banks remain mostly vegetated as a result of the City’s stormwater management philosophies. Stream banks that were armored with riprap as a result of previous stream bank stabilization efforts are currently allowed to re-vegetate naturally.

Maintenance and improvements to the MS4 system are funded by stormwater utility fees collected within the City. Maintenance activities include cleaning inlets of debris and sediment, maintaining channels to reduce erosion and maximize pollution reduction capabilities, and the removal of blockages. Improvements to the MS4 system include solving watershed scale infrastructure problems, channel stabilization, safety improvements, stream habitat enhancement, water quality enhancement, and resolving flooding problems associated with stormwater generated from public streets.

## 2.5 Land Use Composition Estimates

The number of square miles and percentage of the MS4 service area under residential, commercial, industrial and open space land use categories are provided in **Table 2-3**. These percentages include the incorporated area and ETJ for the City. **Figure 2-2** provides a map of these land use areas.

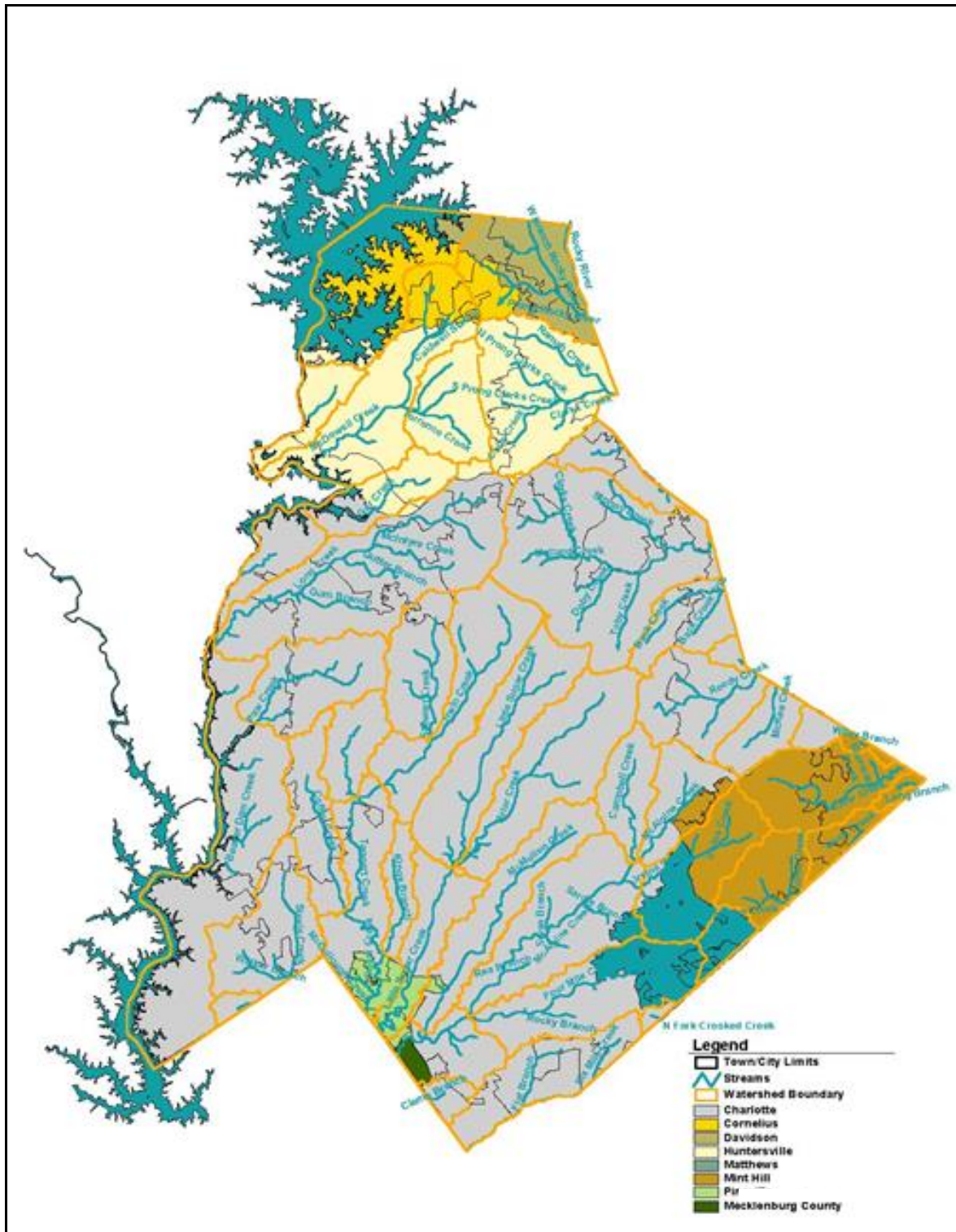
**Table 2-3:** Percentage of Land Uses in the City of Charlotte (including ETJ).

Land use Category	Number of Square Miles	% of Land Use within City of Charlotte and ETJ
Residential	132	35
Commercial	56	15
Industrial	13	4
Open Space	98	26
Institutional	20	5
Transportation/Other	54	14
Lake Water/Open Space	3	1

## 2.6 Estimate Methodology

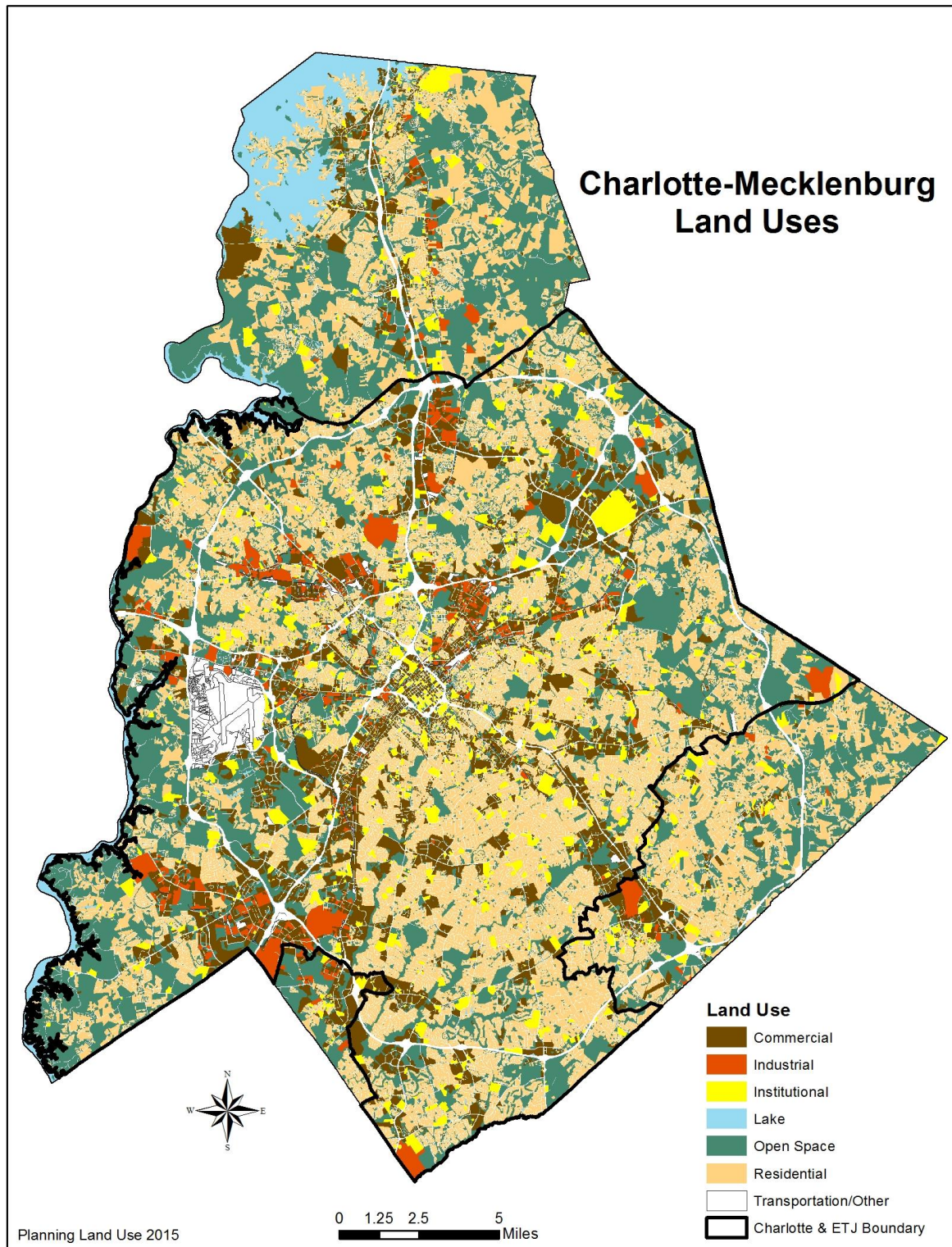
Land use estimates are derived from Mecklenburg County land parcel GIS data.

**FIGURE 2-1**  
**Charlotte Jurisdictional Area and Watersheds**





**FIGURE 2-2**



### **Section 3: Public Education and Outreach Program**

During the annual report period, the Public Education and Outreach Program distributed educational materials to the community and conducted outreach activities focused on the impacts of stormwater discharges on water bodies per the SWMP. The following sub-sections explain the BMPs implemented, target audience and pollution sources, outreach strategy, measures of success, future goals and planned activities per BMP, and program assessment detailing activities completed under this program.

#### **3.1 BMP Summary Table**

**Table 3-1** provides information concerning the BMPs implemented to fulfill the Public Education and Outreach Program requirements. Funding for the BMPs in this section is covered by local stormwater utility fees.

**Table 3-1: BMP Summary Table for the Public Education and Outreach Program.**

<b>BMP</b>	<b>BMP Description</b>	<b>Schedule (yrs)</b>					<b>Responsible Position</b>
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
Describe target pollutants and target pollutant sources	Describe the target pollutants and target pollutant sources the permittee's public education program is designed to address and why they are an issue.	X					Water Quality Program Manager
Describe target audiences	Describe the target audiences likely to have significant stormwater impacts and why they were selected.	X					Water Quality Program Manager
Informational Web Site	The permittee shall promote and maintain, an internet web site designed to convey the program's message.	X	X	X	X	X	Water Quality Program Manager
Distribute public education materials to identified user groups.	Distribute general stormwater educational material to appropriate target groups as likely to have a significant stormwater impact. Instead of developing its own materials, the permittee may rely on state-supplied Public Education and Outreach materials, as available, when implementing its own program.	X	X	X	X	X	Water Quality Program Manager
Promote and maintain Hotline/Help line	Promote and maintain a stormwater hotline/helpline.	X	X	X	X	X	Water Quality Program Manager
Implement a Public Education and Outreach Program.	The permittee's outreach program, including those elements implemented locally or through a cooperative agreement, shall include a combination of approaches designed to reach the target audiences. For each media, event or activity, including those elements implemented locally or through a cooperative agreement the permittee shall estimate and record the extent of exposure.	X	X	X	X	X	Water Quality Program Manager

### 3.2 Target Pollutants and Sources

**Table 3-2** provides the specific pollution sources targeted for the public education program as well as a description as to why the sources were important for protecting water quality in the City.

**Table 3-2: Targeted Pollution Sources for the Public Education and Outreach Program.**

Pollution Source	Issue
Lawn Care Activities	Improper application, handling and storage of lawn care products such as pesticides, herbicides and fertilizers can result in the discharge of pollutants to the storm drain system. Improper disposal of grass clippings and leaves can negatively impact water quality by producing increased BOD and decreased DO levels in streams. Significant residential development exists in the City of Charlotte with the potential for negative water quality impacts associated with improper lawn care activities.
Improper Disposal	Improper disposal can result in the discharge of a variety of pollutants to the storm drainage system. This can be a problem at construction sites where paint and other construction wastes are generated and in established commercial and residential areas where used oil, grease, animal waste, carpet cleaning wastes and a variety of other pollutants can be a problem.
Poor Housekeeping	Poor housekeeping can result in the discharge of petroleum products, miscellaneous chemicals and other wastes to the storm drain system and surface waters. This is usually a problem at commercial and industrial facilities.
Erosion	Poor erosion control at construction sites results in sediment discharges to the storm drainage system. Also, excessive volumes of stormwater runoff cause scouring of the creek banks resulting in sedimentation of the streams.

### 3.3 Target Audience

The target audiences for the public education program included those entities that could have significant positive and/or negative impacts on water quality conditions. The audiences that were selected are listed below along with an explanation as to why they were targeted for educational outreach.

General Public: Homeowners between the ages of 25 and 55 were selected as a primary target for the educational program due to the significant positive and negative impacts they could have on water quality conditions. This age group represents about 55% of the residents of the City. This is also the age group that will most likely engage in activities such as disposal of auto oil and other wastes, disposal of yard wastes, application of fertilizers, pesticides and herbicides, etc. This age group also represents the target group that is more inclined to report pollution problems observed in streams and lakes and participate in volunteer water quality programs. The City receives an average of 1,000 reported water quality problems annually, the majority of which originate from phone calls from the general public. The public education program aims to increase public awareness about water quality problems/concerns, pollution prevention activities, volunteer programs, and how they can identify and report water pollution problems.

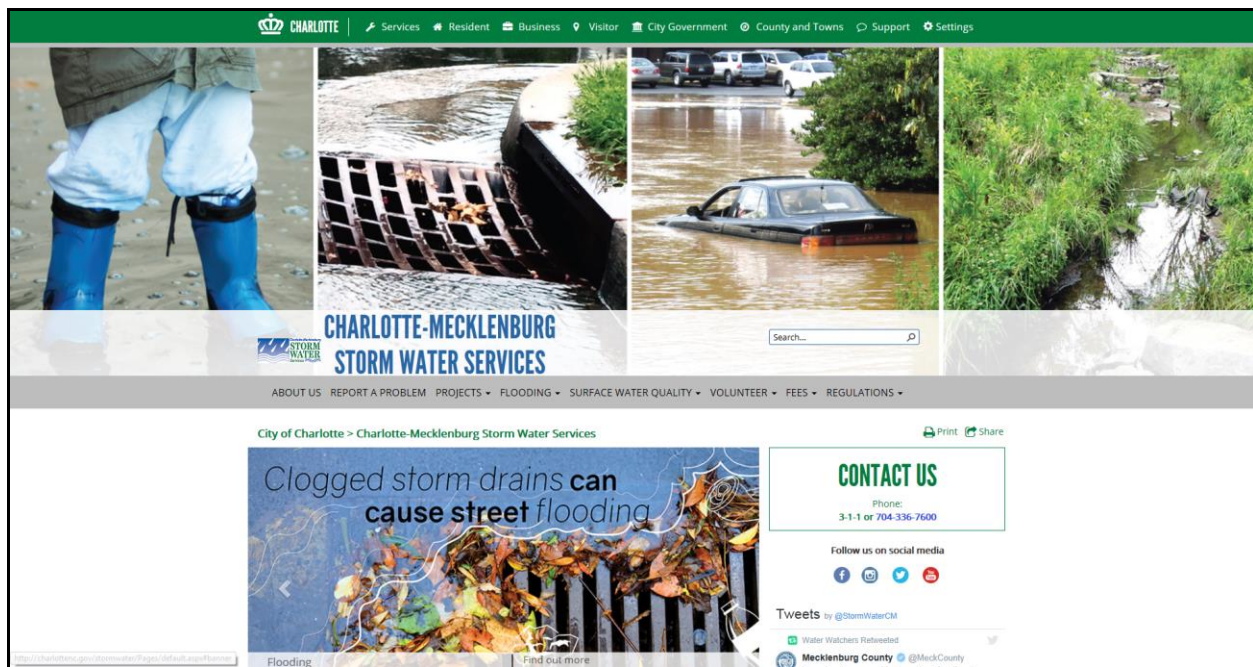
Commercial: Commercial facilities were targeted for the educational program due to the significant negative impacts they could have on water quality by potentially improperly handling



and disposing of wastes, making illicit connections to the storm drain system and practicing poor housekeeping at their facilities.

### 3.4 Informational Website

A significant amount of resources were used to continue promoting and maintaining the CMSWS website <http://charlottenc.gov/StormWater> (**Figure 3-1**). This website continued to be one of the best ways to provide the general public with water quality information. A vast amount of water quality information is provided on this website including, but not limited to, pollution prevention fact sheets, activities and lessons for kids, volunteer activities, sediment and erosion, regulations, data, maps, watershed information, and stormwater projects. **Table 3-8** shows the number of website page views at 288,432 for FY2016, of these the number of unique page views was 222,410.



**Figure 3-1:** CMSWS Main Webpage

### 3.5 Public Outreach Materials

This outreach mechanism was used to target specific pollution sources associated with the general public and industrial/commercial facilities including lawn care practices, handling of used oil and other automotive wastes, housekeeping techniques, etc. Public outreach materials were also used to increase public reporting of pollution problems. **Figure 3-2** shows an example of a brochure that was distributed during responses to citizen requests for service, presentations and at event displays. The following provides a list of topics for the written outreach materials/handouts available to staff for distribution during citizen requests for service:



**Figure 3-2:** Example of a brochure distributed as part of Citizen Requests for Service and at public events

- A Guide to Used Oil Recycling
- Scoop the Poop (proper handling of animal waste)
- Only Rain Goes Down The Storm Drain – The Citizen’s Guide to Pollution Prevention
- Volunteer Opportunities
- A Brief Look at Charlotte-Mecklenburg Storm Water Services – Your Storm Water Fees at Work
- Grease Free (proper disposal of grease from Charlotte Water Department)
- Household Hazardous Waste – What do you do with left over chemicals
- Mobile Detailer Best Management Practices
- Landscapers Best Management Practices
- Painters Best Management Practices
- Contractors Best Management Practices
- Carpet Cleaners Best Management Practices

- Vehicle Service Best Management Practices
- Food Service Best Management Practices
- Multi-family Best Management Practices
- Stone Cutting & Fabrication Industry Best Management Practices
- Concrete Industry Best Management Practices
- Commercial Property Management Best Management Practices
- Asphalt Sealing Best Management Practices
- Swimming Pool & Spa Industry Best Management Practices
- Dry Detention BMP Maintenance
- Rain Garden BMP Maintenance
- Sand Filter BMP Maintenance
- SW Wetland BMP Maintenance
- Wet Pond BMP Maintenance
- Environmental Notices – Disposal into the storm drain is against the law (available in English, Spanish, Chinese, Vietnamese, and Korean)

### 3.6 Public Hotline/Help Line

The City, in cooperation with Mecklenburg County, continued to operate a joint customer service hotline that helps direct citizens to appropriate resources for their questions and concerns including reporting of pollution. Citizens were able to dial 311 to report a variety of stormwater issues such as pollution, flooding, and blockages to the drainage system. During this past fiscal year, a total of 3,127 calls were received by 311 and referred to CMSWS. Out of this total

number, 476 resulted in service requests related to water quality issues within the City of Charlotte.

Of the 3,127 calls received, the highest number came from citizens. Calls from citizens as a group made up 54% of all calls, which was 38% higher than from any other audience. This is important information for targeting education campaigns related to pollution reporting. **Table 3-3** provides information about the number and type of callers that reported these issues.

**Table 3-3: FY2016 Service Request Source Summary**

Caller Type	Number of Service Requests*
Citizen	257
Staff	74
Charlotte Fire Department	45
Charlotte Water	38
Charlotte Storm Water Services	35
State – Division of Water Resources	5
Other	7
Business	8
Towns	0
Environmental Protection Agency	4
Charlotte-Mecklenburg Police Dept.	3
<b>TOTAL</b>	<b>476</b>

\* Source summary data includes all types of service requests within City of Charlotte jurisdiction.

In addition to the 311 hotline, CMSWS also provided the public with a mobile application called “Water Watchers” to report pollution. There were 220 downloads of the application during FY2016, making for a total of 1,383 downloads since the application was launched in FY2013. This past year, there were 35 reports of pollution using the application. The application allows users to provide pictures of their concern and this has proven very helpful to staff for providing follow-up services.

A variety of tools and events were used to promote the 311 hotline and the Water Waters mobile application including:

- giving away promotional products such as magnets and water bottles with 311 and Water Watcher information
- providing information about reporting pollution on a website
- working with local TV stations to produce news segments focused on reporting pollution,
- buying media time and airing a TV ad focused on reporting pollution,
- designing and mailing the October utility bill insert, focused on volunteering and reporting pollution, to approximately 255,276 residents
- Hanging a six-story banner on a parking garage across from a popular exit ramp off I-277 for a month (**Figure 3-3**).



**Figure 3-3: Typical Parking Garage Banner**



An additional unique outreach tool for publicizing pollution reporting was the design and implementation of three vehicle wraps (**Figure 3-4**). These vehicle wraps have been placed on three CMSWS vehicles and each addressed a different subject – storm drains lead to streams, smelly and discolored streams, and mud pollution. In addition to informing and educating, these wraps encourage residents to recognize and report pollution by calling 311. The vehicle wraps were completed towards the end of the fiscal year and were driven by CMSWS staff during illicit discharge investigations and service request responses. It is estimated that the vehicle wrap will last about five years.



**Figure 3-4:** Vehicle Wrap on a CMSWS vehicle

### 3.7 Public Education and Outreach Program

Rather than use a “one size fits all” strategy, the public education and outreach program presented clear messages through a variety of media. The multi-faceted program, described below, helped the citizens of Charlotte choose behaviors to help protect water quality.

#### 3.7.1 Utility Bill Inserts

Each month throughout the annual report period, the City distributed a water/sewer utility bill to between 255,276 – 282,322 residents. The total number of utility bill inserts that were mailed was 1,707,629. **Figure 3-5** shows a typical utility bill insert that was mailed. The inserts focus on various topics which included volunteering, water quality, flooding, CMSWS services and fee changes.



**Figure 3-5:** June 2016 Utility Bill Insert

### 3.7.2 Public Events

CMSWS staff participated in a variety of community events that were used to promote education campaigns, give away promotional products, provide face-to-face education opportunities, and provide formal presentations on water quality topics when appropriate. **Table 3-4** shows the public event participation for FY2016.

**Table 3-4:** FY2016 Public Event Participation

Date Conducted	Event Name	Number of Attendees Interacted With
08/08/15	Greenway Green Day	19
08/23/15	Greenway Outreach	30
09/17/15	Open Streets Festival	30
10/02/15	City Environmental Vendor Fair	100
10/12/15	UNCC Career Day	80
10/24/15	Greenway Outreach	43
11/05/15	Air Quality Forum	80
11/21/15	Passport to STEM	400
01/26/16	Caroline Green Industry Network	100
02/27/16	Annual Tree Seedling Sale (MSWCD)	85
03/14/16	Realtors Expo	800
03/19/16	UNCC Weather Fest	50
04/08/16	First Friday/Earth Day	60
04/22/16	Knights Game	10,227
04/23/16	Earth Day	200
04/23/16	Matthews Earth Day	150
04/30/16	Bark In The Park	1,000
05/01/16	Landscapers Breakfast	60
<b>TOTAL</b>		<b>13,514</b>

### 3.7.3 Public Presentations

A variety of water quality presentations were available from CMSWS to the general public, interest groups, businesses and industrial facilities upon request. Each presentation, while similar in nature, was also changed depending on the topic of interest and the audience receiving the presentation. For example, this past year presentations were given about yard waste, grease, pollution prevention, general water quality information, and landscaping tips. **Table 3-5** shows the public presentations that were provided during FY2016.

**Table 3-5: FY2016 Public Presentations**

Date	Event Name	Number of Attendees
07/09/15	Arts and Science Council Group	14
07/21/15	Greater Charlotte Apartment Association	30
08/06/15	Queens University Envirowine	6
09/15/15	Regional Stormwater Partnership Tech Talk	30
09/17/15	SWAC	12
09/26/15	Boy Scouts of America	10
11/14/15	Cub Scout Pack 9	38
11/17/15	Engineers, Surveyors, Landscape Architects	180
12/02/15	Land Surveyors & Engineers	60
01/27/16	Swimming Pool Operators Workshop	75
02/03/16	Reedy Creek Nature Center Staff	9
02/24/16	Landen Meadows HOA	30
03/27/16	Creek Challenge Training Workshop	22
04/27/16	Utility Boring Staff	25
05/26/16	Master Naturalist Volunteer Expo	18
	<b>TOTAL</b>	<b>559</b>

### 3.7.4 Classroom Outreach



**Figure 3-6: Enviroscope Model Presentation**

During FY2016, CMSWS staff provided 56 school presentations to 1,330 students, grades K-12, at 17 different schools. There were eight different programs available to the schools which included:

1. Blue Planet
2. Common Water
3. Freddie the Fish
4. Enviroscope Model and Video
5. CMANN Demo and Power Point
6. Festival Table Demonstrations
7. Career Day
8. Water Day

Two stormwater pollution videos (made by a former local meteorologist) and the Enviroscape model were also available on loan to schools upon their request. **Figure 3-6** shows a Water Day presentation using the Enviroscape model.

### 3.7.5 Promotional Items

Promotional items were designed and distributed to complement outreach activities such as group presentations, workshops and public events. All promotional items have the CMSWS website and include other messages as space allows. **Table 3-6** shows the promotional items distributed during FY2016.

**Table 3-6:** FY2016 Promotional Items

Promotional Item	Message
Magnets	Water Watchers App, Reporting Pollution
Pens	Six rotating WQ messages
Stainless Steel Water Bottles	Be the Solution to Water Pollution. Volunteer.
Key Chains	You're the Key to Clean Water
Wildflower seed bookmarks	Minimize fertilizer application
Dog Waste bags	Scoop the Poop
Tattoos and Stickers	"Stormy" mascot
Sunscreen and lip balm	Website only

### 3.7.6 Media Campaign

Significant resources were spent on providing water quality messages through mass media channels because they are the most effective way to reach adult audiences. Media channels used were television, radio, online and print ads, and social media. There were three primary campaigns: Report Pollution, Volunteer, and Flood Safety. Print media included use of a bus wrap, vehicle wraps, a parking garage banner, newspaper ads, and monthly utility bill inserts to promote events and messages. A total of 818 television ads and 328 radio ads ran and CMSWS also worked with a local TV station to produce "Water Wise" segments that were shown on the local news station and cover topics such as Stormwater Pollution, Reporting Pollution, Failing Stormwater Infrastructure, Volunteering, Stream Restoration, and Erosion & Buffers.

CMSWS also made a concerted effort to build a social media presence this past year as more and more people are receiving information through this media channel. Four social media channels were used:

- YouTube Account      <https://www.youtube.com/user/StormWaterServices>
- Facebook Page        <https://www.facebook.com/waterwatchers>
- Twitter Account       <https://www.twitter.com/WaterWatcherCLT>
- Instagram Account    <https://www.instagram.com/stormwatercm>

CMSWS posted all videos and news stories on the You Tube channel. They also provided more content, pictures and videos related to pollution prevention and flood messages on Facebook, Twitter and Instagram and boosted some posts to reach tens of thousands of users. The number of followers on Facebook has increased to over 3,900.

### 3.8 Measurable Goals/Planned Activities for Future Program Years

**Table 3-7** describes the various Public Education and Outreach BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.



**Table 3-7: BMP Measurable Goals for the Public Education and Outreach Program.**

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Describe target pollutants and target pollutant sources	Describe the target pollutants and target pollutant sources the permittee's public education program is designed to address and why they are an issue.	Identify target pollution sources utilizing monitoring and service request data	Review and update target pollution sources as necessary.	Review and update target pollution sources as necessary.	Review and update target pollution sources as necessary.	Review and update target pollution sources as necessary.
Describe target audiences	Describe the target audiences likely to have significant stormwater impacts and why they were selected.	Identify target audiences to adopt desired water quality improvement behaviors	Review and update target audiences as necessary.	Review and update target audiences as necessary.	Review and update target audiences as necessary.	Review and update target audiences as necessary.
Informational Web Site	The permittee shall promote and maintain, an internet web site designed to convey the program's message.	Continue to maintain an informational website to provide program information to the public.	Continue to maintain an informational website to provide program information to the public.	Continue to maintain an informational website to provide program information to the public.	Continue to maintain an informational website to provide program information to the public.	Continue to maintain an informational website to provide program information to the public.
Distribute public education materials to identified user groups.	Distribute general stormwater educational material to appropriate target groups as likely to have a significant stormwater impact. Instead of developing its own materials, the permittee may rely on state-supplied Public Education and Outreach materials, as available, when implementing its own program.	Distribute educational materials at public events, workshops and presentations	Distribute educational materials at public events, workshops and presentations	Distribute educational materials at public events, workshops and presentations	Distribute educational materials at public events, workshops and presentations	Distribute educational materials at public events, workshops and presentations
Promote and maintain Hotline/Help line	Promote and maintain a stormwater hotline/helpline.	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day



Implement a Public Education and Outreach Program.	The permittee's outreach program, including those elements implemented locally or through a cooperative agreement, shall include a combination of approaches designed to reach the target audiences. For each media, event or activity, including those elements implemented locally or through a cooperative agreement the permittee shall estimate and record the extent of exposure.	Continue to implement a plan to conduct education & outreach activities, including a media campaign, that address target pollutants and audiences.	Continue education and outreach activities per the plan.	Continue education and outreach activities per the plan.	Continue education and outreach activities per the plan.	Continue education and outreach activities per the plan.
--	---	--	--	--	--	--

### 3.9 Program Assessment

The overall Public Education and Outreach Program was successfully implemented during the annual report period. The following **Table 3-8** shows a summary of the various items and corresponding data results for activities conducted under the program:

**Table 3-8: Program Summary**

<b>PUBLIC EDUCATION PROGRAM</b>	<b>FY2013</b>	<b>FY2014</b>	<b>FY2015</b>	<b>FY2016</b>	<b>FY2017</b>	<b>FY2018</b>
Utility Bill Inserts	3,300,000	2,913,000	2,916,000	1,707,629		
Public Events	9	15	14	18		
Attendees at Public Events	1,335	2,884	2,683	13,514		
Public Presentations	2	7	11	15		
Attendees at Presentations	473	254	737	559		
School Presentations	54	56	61	56		
Students at School Presentations	1,402	1,421	1,510	1,330		
Website Page views	99,958	149,786	274,129	288,432		
TV and Radio Advertising Spots	492	1,977	3,761	1,146		
Public Requests to Hotline	2,576	3,262	2,429	3,127		

Overall: A combination of evaluation tools indicates that Charlotte’s residents were successfully being exposed to water quality education messages. It is always difficult to measure the true impact of an education program, but continued program offerings, continued participation in them, and positive results from a public opinion survey indicate that messages were successfully provided through a diverse set of communication channels. The following provides more detail regarding some of the numbers reported above and the results of the stormwater public opinion survey.

Utility Bill Inserts: For FY2016, the decrease in numbers from FY2015 reflects a decrease in the number of customers that are receiving paper bills versus those now receiving electronic billing.

Public Events & Public Presentations: The number of events, presentations, and people reached during FY2016 increased dramatically from FY2015.

School Presentations: The number of presentations and students who participated remained consistent with previous years.

Website Page views: The number of website page views increased by 14,303 (~5.2%) during FY2016.

Stormwater Public Opinion Survey: According to the CMSWS public opinion survey, an awareness level of 57% is being maintained, meaning 57% of residents indicated that they had heard or seen information about stormwater pollution and flooding over the past year. This is an increase from last year’s number of 45%. To further improve awareness of campaign messages,

CMSWS plans to target Hispanic and African American audiences with the media campaigns next year (FY2017). These populations represent 13% and 32% of Mecklenburg County’s population, respectively, and they were not specifically targeted during FY2016. Plans also potentially include the release new water quality and volunteer commercials to refresh the media campaigns.

#### **Section 4: Public Involvement and Participation Program**

During the annual report period, the Public Involvement and Participation Program provided opportunities for the public to participate in program development and implementation per the SWMP. The following sub-sections explain activities completed under this program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

##### **4.1 BMP Summary Table**

**Table 4-1** provides information concerning the BMPs implemented to fulfill the Public Involvement and Participation Program requirements. Funding for the BMPs in this section is covered by local stormwater utility fees.

**Table 4-1:** BMP Summary Table for the Public Involvement and Participation Program.

BMP	BMP Description	Schedule (yrs)					Responsible Position
		1	2	3	4	5	
Volunteer community involvement program	The permittee shall include and promote volunteer opportunities designed to promote ongoing citizen participation.	X	X	X	X	X	Water Quality Program Manager
Establish a Mechanism for Public involvement	The permittee shall provide and promote a mechanism for public involvement that provides for input on stormwater issues and the stormwater program.	X	X	X	X	X	Stormwater Division Manager
Establish Hotline/Help line	The permittee shall promote and maintain a hotline/helpline for the purpose of public involvement and participation.	X	X	X	X	X	Water Quality Program Manager
Public Review and Comment	The permittee shall make copies of their most recent Stormwater Plans available for public review and comment.	X	X	X	X	X	Water Quality Program Manager
Public Notice	Pursuant to 122.34 the permittee must, at a minimum, comply with State, Tribal and local public notice requirements when implementing a public involvement/ participation program.	X	X	X	X	X	Water Quality Program Manager

##### **4.2 Volunteer Involvement Program**

###### **4.2.1 Target Audience**

The primary target audience for the Public Involvement and Participation Program included homeowners between the ages of 25 and 55 due to their likelihood to take an interest in their community and become involved in volunteer activities.

#### 4.2.2 Storm Drain Marking Program



**Figure 4-1:** Storm Drain Marker

CMSWS continued to provide volunteers the opportunity to help educate their community about stormwater pollution through the Storm Drain Marking program. This program enabled volunteers to adhere vinyl printed markers (**Figure 4-1**) to storm drains along several streets they had selected in their neighborhoods. CMSWS provided the decals, adhesive, safety vests and information forms for completion by the groups. Following the completion of storm drain marking activities, the groups

submitted a report that included the street names and number of drains that were marked, information concerning the condition of storm drains, and whether any pollutants were detected. CMSWS staff recorded the storm drains that had been marked and ensured any issues reported received follow-up investigation.

This past year, 927 storm drains were marked by 119 volunteers for a combined total of 286 volunteer hours for this program. **Figure 4-3** shows Storm Drain Marking activities conducted during FY2016. The Storm Drain Marking program is a well-organized and a relatively easy-to-manage activity for successfully including citizens of all ages in stormwater education. Participation has decreased over the last few years as the program is currently marketed across the general public as a whole. It is thought that a more focused approach targeting families and volunteer groups may be more successful for increasing participation in future years.

#### 4.2.3 Adopt-A-Stream Program

Public involvement is an essential component of the City's Program. Charlotte recognizes that without public involvement and support, little progress can be made toward protecting and restoring water quality in its streams. One way that public involvement in Charlotte is achieved is through the implementation of the Adopt-A-Stream program. The objective of this program is for volunteers to "adopt" segments of streams and agree to walk them, picking up trash and reporting any pollution problems found along the way. The program not only serves as a public involvement initiative, but it also allows for interaction and observations of the City's streams by its citizens, which can lead to the identification and elimination of pollution sources.

The Adopt-A-Stream Program is designed in a way that empowers volunteers and provides them with the necessary resources and educational information to assist in improving water quality conditions in Charlotte-Mecklenburg streams. Individuals, families, organized groups, schools, businesses, and industry "adopt" their favorite stream sections and were responsible for walking

these sections a minimum of two times per year. The current Adopt-A-Stream Program format promotes a sense of community ownership and responsibility for local water resources.

During FY2016, a total of 67 groups of volunteers completed 106 stream cleanups under the Adopt-A-Stream Program in the City of Charlotte. A total of 1,280 volunteers dedicated 2,736 hours to picking up trash and reporting pollution in Charlotte-Mecklenburg’s streams. In addition, volunteers removed approximately 14.9 tons of trash and debris. **Figure 4-4** shows Adopt-A-Stream activities conducted during FY2016 and **Table 4-3** provides a summary of important results relating to the program.

#### 4.2.4 The Big Spring Clean

From the mid 1990’s until 2015, the City and County hosted an annual one-day clean-up event called Big Sweep. It was part of clean-up events coordinated across North Carolina by the nonprofit organization “NC Big Sweep”, which dissolved in 2015. In 2016, the event was renamed locally as “The Big Spring Clean” and CMSWS partnered with Keep Mecklenburg Beautiful to begin hosting the event on the second Saturday in May each year.

During FY2016, a total of 265 volunteers participated in The Big Spring Clean and collected 178 bags of trash, 38 bags of recycling and 205 tires. In total, volunteers removed 9.4 tons of trash from local waterways. **Figure 4-2** shows the promotional information used for the event.



**Figure 4-2:** Big Spring Clean Advertisement

#### 4.3 Public Involvement Mechanism

The City of Charlotte and Mecklenburg County established a citizen Storm Water Advisory Committee (SWAC) in 1994 with the development of their joint stormwater utility (Charlotte-Mecklenburg Storm Water Services). SWAC was established to review policies, capital and operational programs, and appeals for the stormwater programs of the City and County. SWAC reviewed stormwater management policies, long-range plans and budgets and made recommendations and comments to the City Council and Board of County Commissioners. The advisory committee also heard appeals and decided on appealed erosion control violations, pollution control violations, service charges, credits and adjustments. SWAC members are

nominated and subsequently appointed by the Mecklenburg Board of County Commissioners, Charlotte City Council, Charlotte Mayor and Town Boards. SWAC included residents from the City of Charlotte. SWAC has served as the City’s stormwater management citizen advisory panel for the purpose of involving the public in the development of the SWMP and the implementation of program requirements.

#### 4.4 Public Hotline/Help Line

The City, in cooperation with Mecklenburg County, continued to operate a joint customer service hotline to get information about a variety of concerns. Citizens were able to dial 311 any time of the day to report pollution, flooding, blockages to the drainage system as well as request other City/County services. CMSWS staff have worked with the customer service group to make sure calls were directed to appropriate personnel and handled in a timely manner. The hotline/help line is discussed further in sub-section 3.6 above.

#### 4.5 Public Review and Comment Opportunities

The City provided opportunities for public review and comment in the implementation of its permit and SWMP Plan through website information and interactions with the Charlotte-Mecklenburg Storm Water Advisory Committee (SWAC).

#### 4.6 Public Notice

No public notices were issued in relation to the City’s NPDES permit during FY2016.

#### 4.7 Measurable Goals/Planned Activities for Future Program Years

**Table 4-2** describes the various Public Involvement and Participation Program BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.



**Table 4-2: BMP Measurable Goals for the Public Involvement and Participation Program.**

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Volunteer community involvement program	The permittee shall include and promote volunteer opportunities designed to promote ongoing citizen participation.	Continue to maintain a public involvement and participation program that outlines campaigns and tools to encourage public involvement	Continue public involvement and participation activities per the plan.	Continue public involvement and participation activities per the plan.	Continue public involvement and participation activities per the plan.	Continue public involvement and participation activities per the plan.
Establish a Mechanism for Public involvement	The permittee shall provide and promote a mechanism for public involvement that provides for input on stormwater issues and the stormwater program.	Maintain the Storm Water Advisory Committee.	Maintain the Storm Water Advisory Committee.	Maintain the Storm Water Advisory Committee.	Maintain the Storm Water Advisory Committee.	Maintain the Storm Water Advisory Committee.
Establish Hotline/Help line	The permittee shall promote and maintain a hotline/helpline for the purpose of public involvement and participation.	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day	Maintain a hotline that receives information from the public 24 hours a day
Public Review and Comment	The permittee shall make copies of their most recent Stormwater Plans available for public review and comment.	Maintain an informational website which includes the SWMP available for review and comment.	Maintain an informational website which includes the SWMP available for review and comment.	Maintain an informational website which includes the SWMP available for review and comment.	Maintain an informational website which includes the SWMP available for review and comment.	Maintain an informational website which includes the SWMP available for review and comment.
Public Notice	Pursuant to 122.34 the permittee must, at a minimum, comply with State, Tribal and local public notice requirements when implementing a public involvement/ participation program.	Comply with State and local public notice requirements when making major changes to the stormwater program and/or applying for permit	Comply with State and local public notice requirements when making major changes to the stormwater program and/or applying for permit renewals.	Comply with State and local public notice requirements when making major changes to the stormwater program and/or	Comply with State and local public notice requirements when making major changes to the stormwater program and/or applying for permit renewals.	Comply with State and local public notice requirements when making major changes to the stormwater program and/or applying for permit renewals.





		renewals.		applying for permit renewals.		
--	--	-----------	--	----------------------------------	--	--

#### 4.8 Program Assessment

The Public Involvement and Participation Program was successfully implemented during the annual report period. In addition, although not currently listed as a required BMP in the City’s NPDES MS4 permit or SWMP, the City coordinates with Mecklenburg County to sponsor an Adopt-A-Stream program and a Big Spring Clean event. Data on these additional programs is included in the table below for reference. The **Table 4-3** shows a summary of the various items and corresponding results for activities conducted under the program:

**Table 4-3: Program Summary**

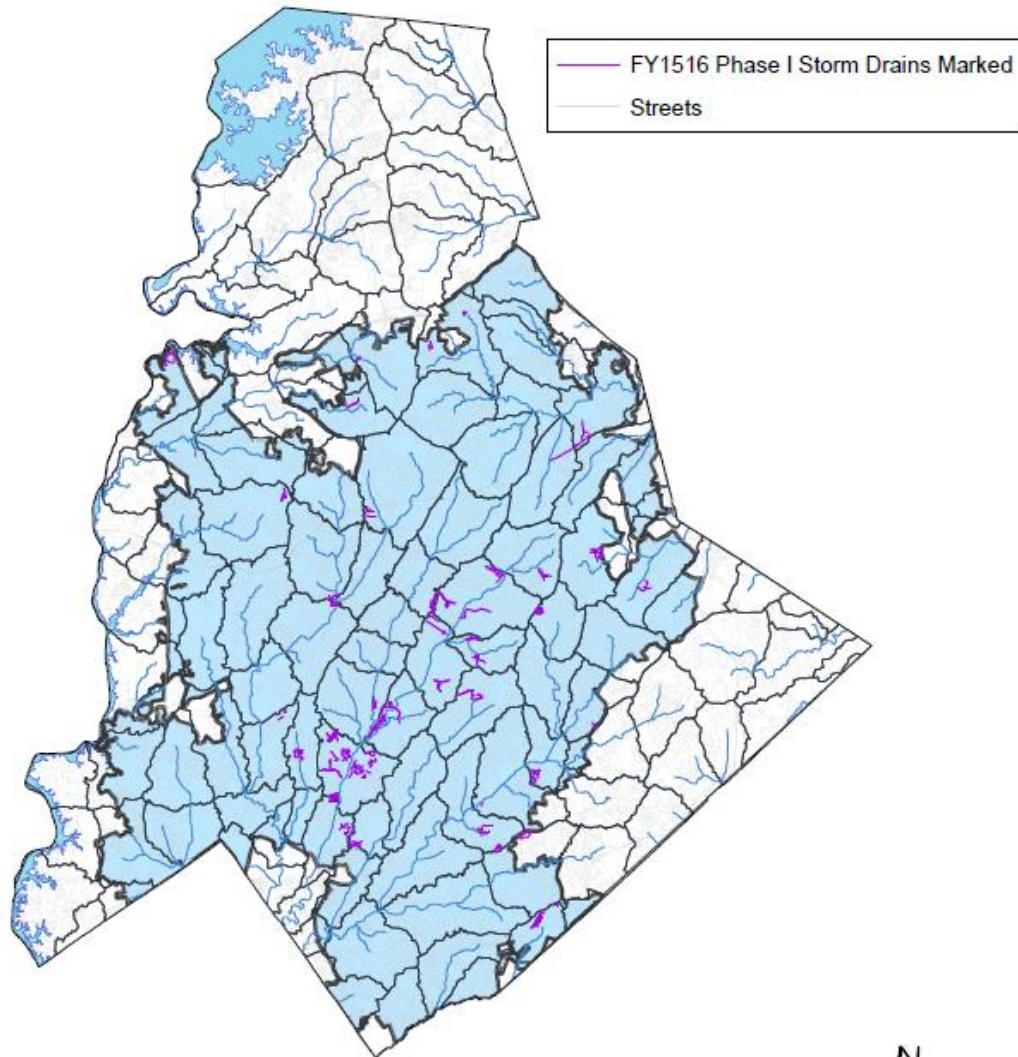
<b>PUBLIC INVOLVEMENT PROGRAM</b>	<b>FY2013</b>	<b>FY2014</b>	<b>FY2015</b>	<b>FY2016</b>	<b>FY2017</b>	<b>FY2018</b>
Storm Drain Marking volunteers	231	89	125	119		
Storm Drain Marking volunteer hours	668	216	198	286		
Storm drains marked	1,663	956	983	927		
Number of SWAC meetings conducted	8	9	10	10		
Number of Persons attending SWAC meetings	76	88	82	96		
Number of Adopt a Stream Groups	81	84	64	67		
Stream Clean-ups conducted	128	141	98	106		
Adopt a Stream volunteers	1,540	1,983	1,211	1,280		
Adopt a Stream volunteer hours	3,556	5,324	2,514	2,736		
Adopt a Stream trash removed (Tons)	9	16	9.6	14.9		
Big Spring Clean Volunteers	N/A	N/A	N/A	265		
Big Spring Clean trash removed (Tons)	N/A	N/A	N/A	9.4		

The City of Charlotte’s Public Involvement and Participation Program provides a combination of activities that allows residents to be involved in the City’s stormwater management program and the opportunity to comment on components of the City’s plan to meet NPDES MS4 permit requirements. The following provides an overview of the program’s effectiveness:

- **Storm Drain Marking Program:** The number of volunteers decreased slightly but the number of volunteer hours increased which allowed the number of storm drains marked to remain consistent during FY2016. **Figure 4-3** shows Storm Drain Marking activities conducted during FY2016.
- **Adopt-A-Stream Program:** The number of groups participating increased from FY2015 to FY2016. One-time stream clean-ups are becoming more popular with groups verses conducting two clean-ups per year, which has traditionally been required. **Figure 4-4** shows Adopt-A-Stream activities conducted during FY2016.
- **SWAC meetings:** Meeting frequency and participation continues to be maintained. These meetings continue to be a highly effective method for involving the public in policy decisions related to the overall stormwater program.
- **Public Hotline/ Helpline:** The 311 hotline and the Water Watchers Application continued to be successful tools for allowing the public to report water pollution problems.

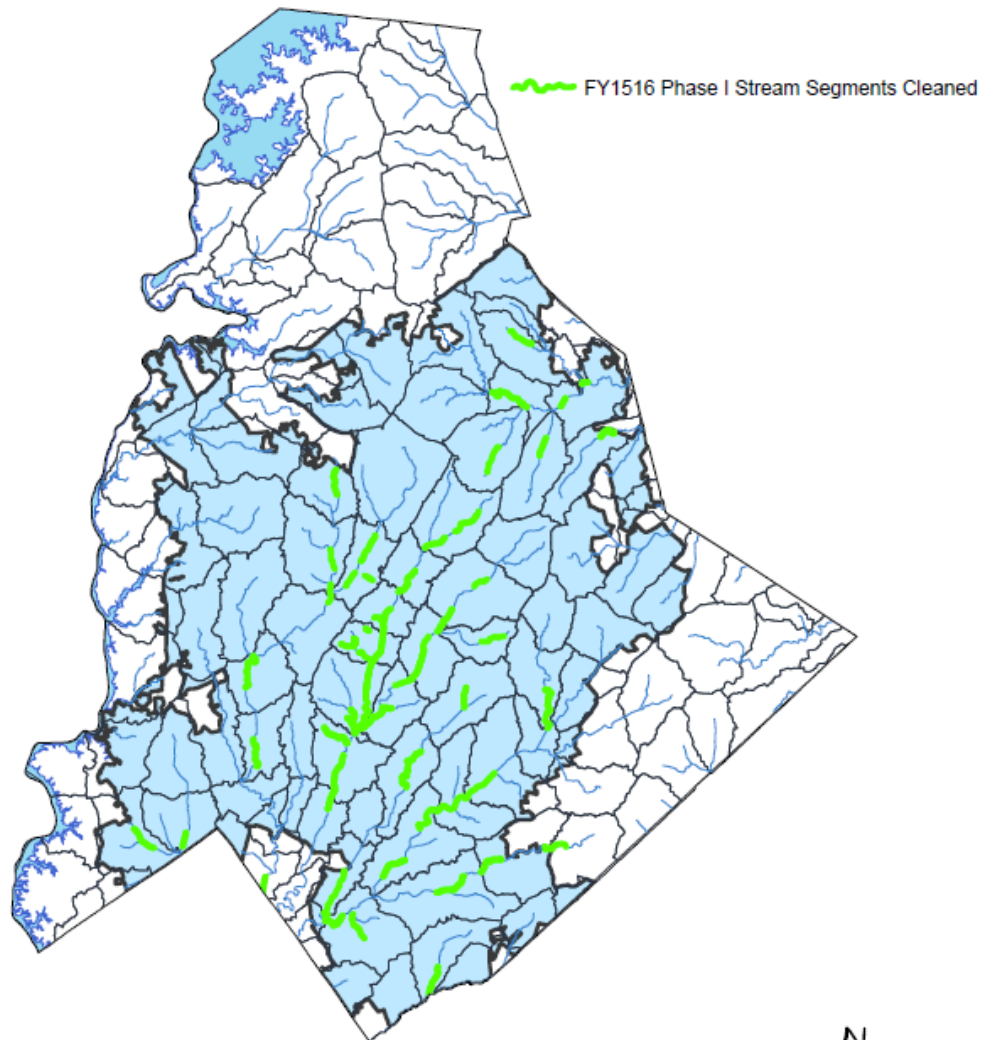
**FIGURE 4-3**

## Charlotte NPDES MS4 Program - FY2016 Storm Drain Marking



**FIGURE 4-4**

## Charlotte NPDES MS4 Program - FY2016 Adopt-A-Stream



## **Section 5: Illicit Discharge Detection and Elimination (IDDE) Program**

During the annual report period, staff implemented the Illicit Discharge Detection and Elimination (IDDE) program to identify and eliminate sources of pollution to the MS4 by inspecting outfalls and streams, educating employees and the public, responding to reports of pollution problems, enforcing the stormwater pollution control ordinance, and other efforts per the SWMP. The following sub-sections explain activities completed under the IDDE program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

### **5.1 BMP Summary Table**

**Table 5-1** provides information concerning the BMPs implemented to fulfill the IDDE Program requirements. Funding for the BMPs in this section is covered by local stormwater utility fees.

**Table 5-1: BMP Summary Table for the Illicit Discharge Detection and Elimination Program.**

<b>BMP</b>	<b>BMP Description</b>	<b>Schedule (yrs)</b>					<b>Responsible Position</b>
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
Maintain appropriate legal authorities	Maintain adequate ordinances or other legal authorities to prohibit illicit connections and discharges and enforce the approved IDDE Program.	X	X	X	X	X	Water Quality Program Manager
Maintain a Storm Sewer System Base Map	The permittee shall maintain a current map showing major outfalls and receiving streams.	X	X	X	X	X	Water Quality Program Manager
Inspection / detection program to detect dry weather flows at MS4 outfalls	Maintain written procedures and/or Standard Operating Procedures (SOPs) for detecting and tracing the sources of illicit discharges and for removing the sources or reporting the sources to the State to be properly permitted. Written procedures and/or SOPs shall specify a timeframe for monitoring and how many outfalls and the areas that are to be targeted for inspections.	X	X	X	X	X	Water Quality Program Manager
Employee Training	Conduct training for appropriate municipal staff on detecting and reporting illicit connections and discharges.	X	X	X	X	X	Water Quality Program Manager
Maintain a public reporting mechanism	Maintain and publicize reporting mechanism for the public to report illicit connections and discharges. Establish citizen request response procedures.	X	X	X	X	X	Water Quality Program Manager
Documentation	The permittee shall document the date of investigations, any enforcement action(s) or remediation that occurred.	X	X	X	X	X	Water Quality Program Manager

### **5.2 Ordinance Administration and Enforcement**

The City adopted its original Stormwater Pollution Control Ordinance on January 30, 1995 for the initial NPDES MS4 permit term. The ordinance was subsequently updated and amended on March 22, 2004 and June 9, 2008 in order to improve overall effectiveness. This ordinance continued to be implemented as part of the NPDES MS4 permit program and SWMP. All procedures and guidelines for proper administration and enforcement of the ordinance were

reviewed and updated, as necessary. These procedures and guidelines along with all other information relevant to the IDDE program were included in the IDDE Manual.

Currently, the ordinance has four sections that authorize the issuance of Notices of Violation (NOVs). Those sections are: 18-80(a) Illicit Discharge(s) and Disposal(s), 18-80(b) Illicit Connection(s), 18-80(c) Accidental Discharge(s), and 18-80(d) Obstruction. Cumulatively from FY1995 through FY2016, a total of 968 NOVs have been issued under this Ordinance. Historically, the majority of these NOVs have been issued for either the improper disposal of wash water or wastewater or the illicit discharge of sewage.

During FY2016, a total of 109 NOVs were issued, which is an increase of 27% from FY2015. Of these, 107 were issued for illicit discharges/disposals, one for illicit connections, and one for accidental discharges. The NOV categories for illicit discharges/disposals based on material type were concrete (6), cooking grease (11), motor oil (5), paint (6), petroleum fuels (7), sediment (3), sewage (38), wash water (15), waste water (6), and Other (10). **Figure 5-1** shows the types and locations of the NOVs issued during FY2016.

Seven monetary enforcement penalties totaling \$24,202.50 were issued during FY2016. Five of the seven were repeat violators and the other two were first-time violators where penalties were warranted due to the scope and severity of the cases.

### 5.3 Stormwater System Inventory and Storm System Base Map

The City collects stormwater system inventory utilizing two different teams. One focuses on walking stream channels to inspect outfalls, identify and collect data on new outfalls, and to identify dry weather flows. The other team collects data on all other parts of the system (catch basins, inlets, pipes, etc.). Both teams collect and store data using GPS and GIS.

A five-year stream-walk plan was developed during FY2013 for outfall data collection (**Figure 5-2**). Every sub-basin will be walked and all outfalls within those sub-basins will be inventoried/re-inventoried and inspected for a minimum of one time between FY2013 – FY2017. Higher priority sub-basins with a history of poor water quality and a higher number of illicit discharges are scheduled to be walked every other year.

During FY2016, a total of 21 sub-basins covering 229 stream miles were walked and assessed under the stream-walk program resulting in 260 new outfalls added to the inventory and 506 previously inventoried outfalls receiving inventory QA/QC. **Figure 5-3** shows these sub-basins and the outfalls inventoried. As far as other system inventory collection during FY2016, data was collected in 13 work zones, which are each about one square-mile in area. Data was also collected in the field or by desktop data creation for 162 municipal project sites.

All stormwater inventory data is stored in GIS. The data receives a QA/QC review before it is finalized. As the data is updated, it is made available to the public through a web-based geospatial data site called “Virtual Charlotte”.

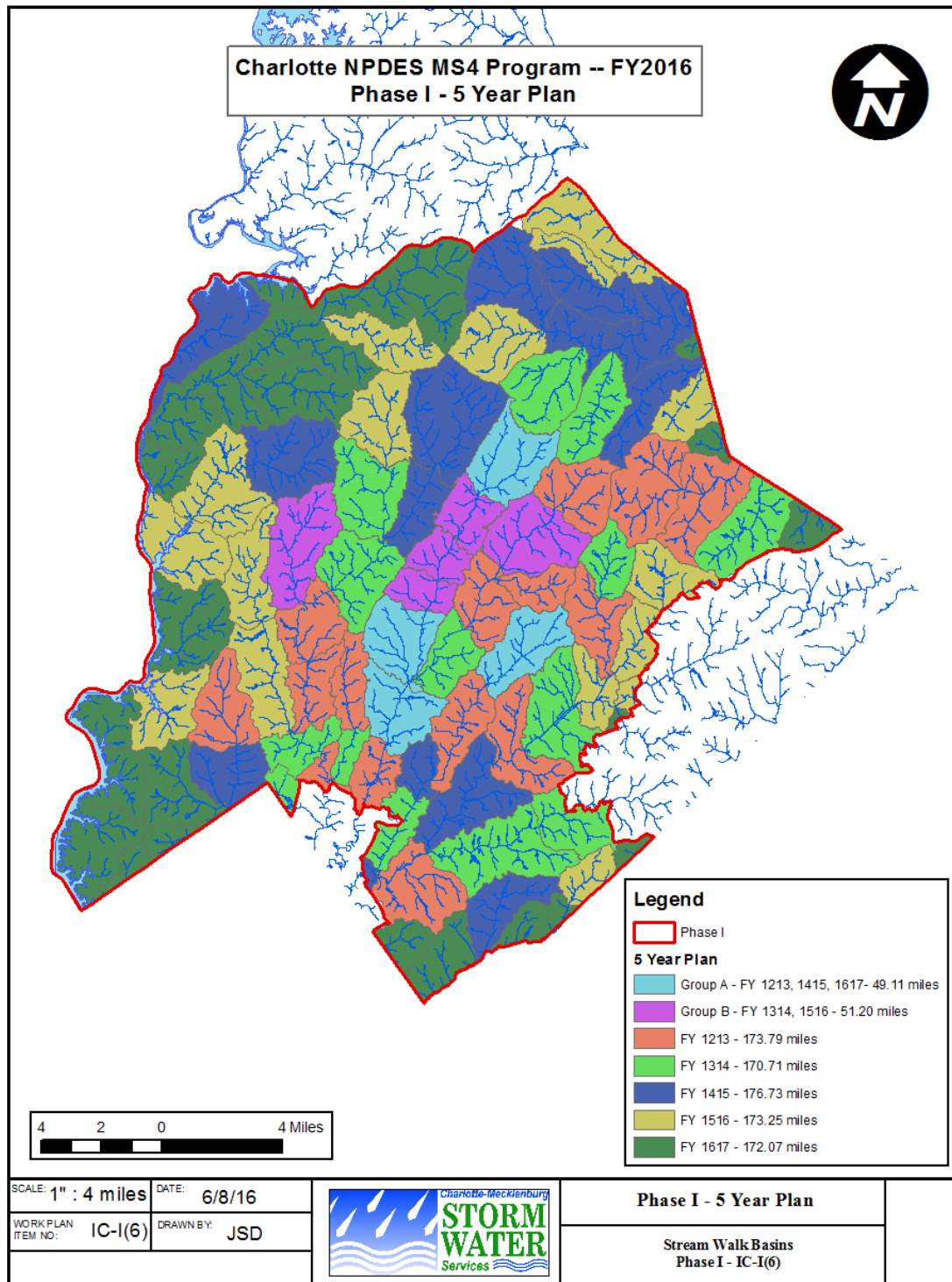


**FIGURE 5-1**

Charlotte NPDES MS4 Program - FY2016  
City of Charlotte  
Notice of Violation and Enforcement Locations

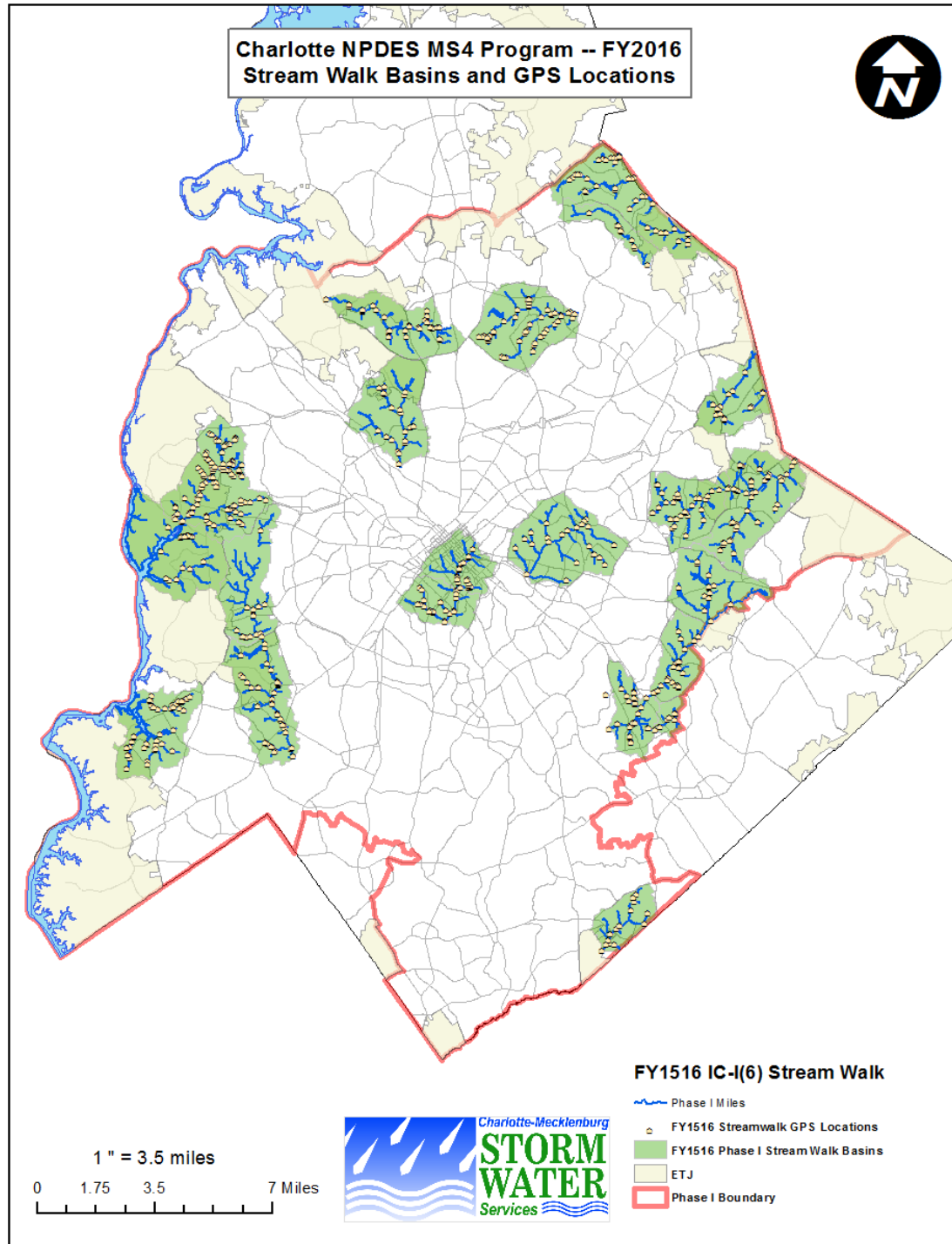


**FIGURE 5-2**





**FIGURE 5-3**



#### 5.4 Illicit Discharge Detection and Elimination Program

##### 5.4.1 Outfall Inspection and Dry Weather Flow Detection

During FY2016, a total of 820 outfalls were inspected for physical condition, the presence of dry weather flows (DWFs), and illicit discharges. These inspections were primarily conducted as part of two programs:

- Stream-Walks
- Hot Spot Investigations

Standard Operating Procedures for both programs were documented in the NPDES MS4 IDDE Manual which was also reviewed and updated during FY2016. In addition, outfall inspections occur during service request and field investigations, municipal facility inspections, and industrial facility inspections.

##### Stream-Walks:

As discussed in Section 5.3 above, Stream-Walks involved CMSWS staff walking the stream channel to inspect outfalls, sample DWFs, and document variety of other water quality related problems. During FY2016, a total of 766 outfalls were inspected under this program. In addition, a total of 87 DWFs were detected at outfalls with 15 of these being sampled. Various reasons made it impossible to sample all DWFs including very low flows (seepage), frozen water and others. The DWFs were sampled for physical parameters (temperature, conductivity, pH, etc.) as well as fecal coliform and total phosphorus. Fecal coliform samples were also collected from areas where tributaries entered the channel being walked.

In total, 360 fecal coliform and 15 Total Phosphorous samples were collected. Of these, 17 fecal coliform sample results were above the fecal coliform action limit of 3,000 col/100mL. Follow-up investigations of these exceedances resulted in the detection and elimination of five illicit discharges.

During the FY2016 stream-walk CMSWS staff also documented:

- 16 stream blockages
- 11 areas of severe stream bank erosion
- 13 riparian wetlands
- new stream reference reaches

##### Hot Spot Investigations:

Hot Spot Investigations or IDEP, as discussed in more detail in Section 5.4.3, involves CMSWS staff conducting inspections in targeted basins with a higher potential for illicit discharge activities based on criteria such as monitoring data, prior identified illicit discharges, age of sewer infrastructure, commercial land use density, and others. During FY2016, eight minor outfalls (<36" in diameter) were inspected in the Upper McMullen Creek basin under the IDEP

program. This resulted in one DWF detected which was determined to be groundwater seepage and therefore not sampled.

CMSWS staff also inspected a total of 46 outfalls as part of the following activities:

- service requests and field investigations,
- municipal facilities inspections and
- industrial facility inspections

#### 5.4.2 Water Quality Monitoring

Water quality monitoring continues to be used to identify illicit connections and discharges, identify water quality problem areas that may need additional investigations, and track long and short-term water quality trends. CMSWS continued to use Watch and Action levels for various pollution parameters to trigger the need for follow-up action, which resulted in the detection and elimination of two illicit discharges during FY2016. The action levels are based on either state water quality standards or historical local data analyses. More details on the water quality monitoring program are provided in Section 10.

#### 5.4.3 Illicit Discharge Elimination Program (IDEP)

IDEP is a sub-set program of the overall IDDE program and is implemented as a means to quickly assess field conditions and identify illicit discharges in priority stream basins.

As part of IDEP, a priority basin(s) or “hot spot(s)” is/are selected each year based on a variety of monitoring data. Within the priority basin(s), CMSWS staff inspects minor outfalls and multi-family private sewer systems and samples fecal coliform in areas draining less than 50 acres. Staff uses visual observation, sensory cues, and quick field tests to determine if abnormal conditions exist. This method allows for numerous quick assessments that can be conducted more frequently throughout the year. When compared to previous methods of sampling at



numerous locations within a basin, this program has shown to be just as effective at identifying illicit discharges and more effective in terms of time and cost.

Standard operating procedures have been developed to describe all program activities and protocols and they are reviewed annually. **Figure 5-4** shows cooking grease overflowing from a restaurant grease bin discovered as a result of an IDEP inspection.

**Figure 5-4:** An illicit discharge found and corrected as a result of program inspections

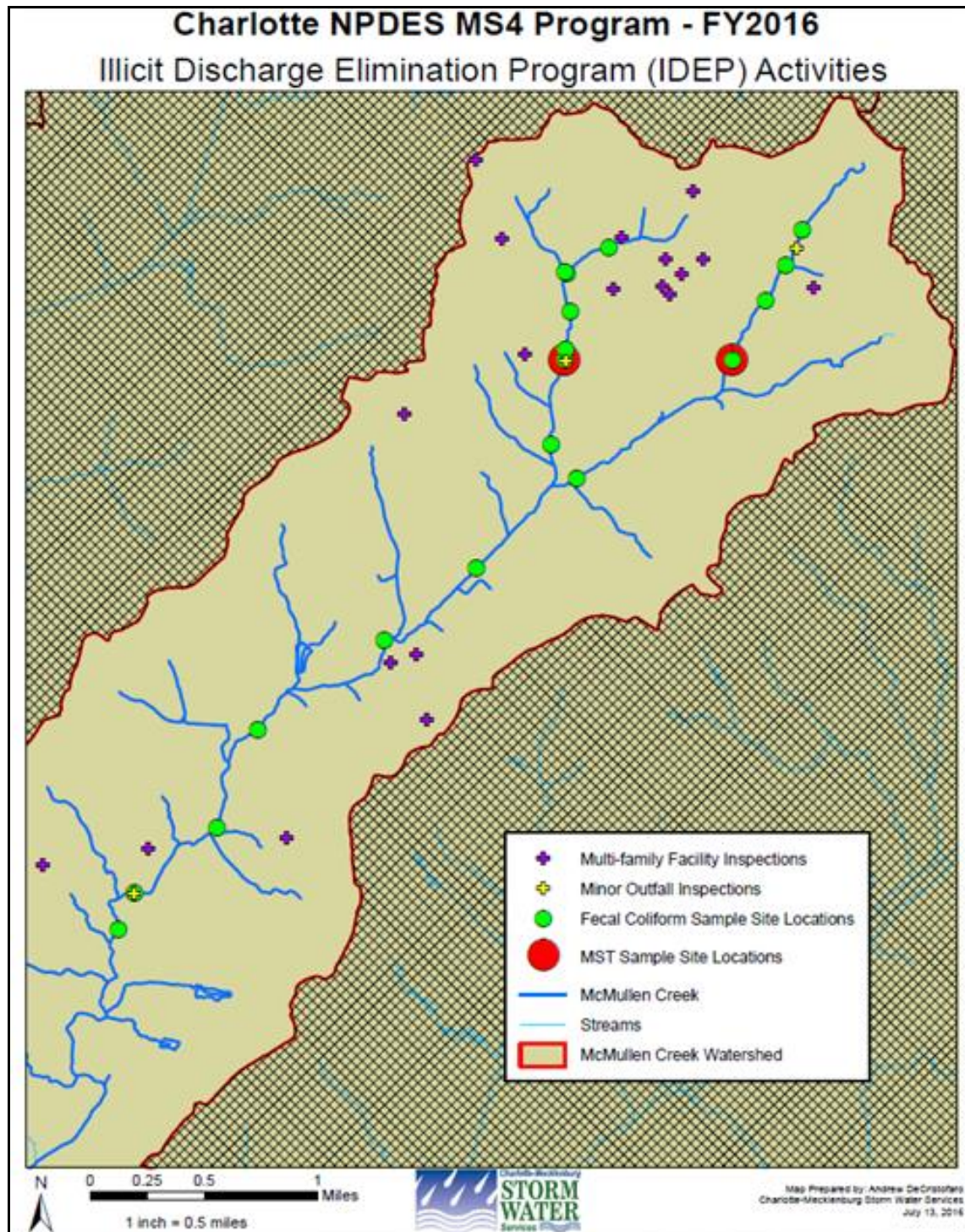
During FY2016, upper McMullen Creek was identified as the priority basin. Inspections occurred at eight minor outfalls and 20 multi-family residential complexes. Eighteen stream sites were sampled for fecal coliform. Two samples (along with 11 others in different basins) were also analyzed using Microbial Source Tracking techniques to help determine potential sources. Samples were analyzed to identify beaver, bird, dog, human, and ruminant sources. At one of the two locations in the basin, a low amount of human fecal source was identified while other sources were either “trace” or “non-detectable”. Locations for IDEP activities within the upper McMullen Creek basin are shown in **Figure 5-5**.

Also as part of the IDEP program, business corridor runs were conducted. They were basically windshield surveys along streets with a high concentration of commercial businesses. Such areas have been hot spots for illicit discharges and poor housekeeping. During FY2016, there were 1,188 businesses and 171 catch basins inspected as part of business corridor runs.

There were 14 poor housekeeping issues identified and all of them were around restaurant and grocery store grease bins. Environmental Notices were issued for all of these issues.



**FIGURE 5-5**





## 5.5 Employee IDDE Training and Education

During FY2016, a total of 965 employees were trained about the detection of illicit connections and discharges, and the various methods for reporting suspected pollution problems.

- 805 employees were trained in classroom or online sessions, and
- 160 employees through employee education events.

The in-classroom training consists of a power point presentation and video. The presentation was customized to each facility and covered the following topics:

- Stormwater Pollution Prevention Plans
- spill response
- the facility's specific stormwater system
- the role of the employees for reducing stormwater impacts and protecting the environment
- detecting and reporting illicit discharges.

The presentation was then followed by a 30-minute video called *Pollution Prevention BMPs* (Excal Visual). This video which presents segments on (1) vehicle and equipment washing, (2) vehicle and equipment maintenance, (3) good housekeeping and spill prevention, (4) spill reporting and response, (5) street maintenance, (6) outdoor storage, (7) landscaping and lawn care. The segments teach employees the proper prevention techniques to use in order to prevent stormwater pollution.

The e-Learning module provides a power point presentation similar to in-classroom training and provides featured BMP videos from *Preventing Stormwater Pollution* which covers job specific pollution prevention for fleet maintenance, land disturbance, parks and recreation, solid waste, streets and drainage, and general municipal jobs. The training video identifies activities from these processes that can contribute to pollution and cause a negative impact to surface water.

CMSWS also promoted the identification and reporting of illicit discharges to employees by setting up an information table and using promotional products and a prize wheel of stormwater questions to engage employee at events such as Earth Day and the City Environmental Vendor Fair. During FY2016, an estimated 160 employees were educated in this way.

### 5.5.1 Commercial Sector Education and Outreach

Certain businesses can be frequent sources of illicit discharges and connections. To improve compliance and reduce the number and severity of illicit discharges coming from the commercial sector, the City proactively provides education to certain commercial business sectors each year.

During FY2016, CMSWS continued to make 14 two-page best practices publications for commercial sectors available on-line. CMSWS also distributed these publications as part of service requests, mailings, training sessions and public events. The publications provided information about pollution prevention for sectors such as auto repair, pool maintenance,

painters, food service, and commercial property management, and a number of others. During FY2016, the CMSWS provided additional outreach to the landscaping and the horizontal directional drilling sectors as follows:

*Landscape sector:*

Education was provided to the Landscape sector by CMSWS staff attendance at two events: the annual City Landscape Contractor's Breakfast and Carolina Green Industry Network Landscaping Conference.

At the Landscape Contractor's breakfast, staff provided one of several presentations to landscape contractors who currently either have a contract with the City or were interested in acquiring one. The presentation covered water quality and pollution prevention and good housekeeping topics and requirements of City contracts related to the landscaping industry. Staff also set up an information table at this event with promotional products and brochures to give away. Approximately 60 people attended this event.

The Carolina Green Industry Network Landscaping Conference is an annual event held in Union County attended by an average of 500 landscaping professionals from the region each year. This past year, CMSWS developed a new display covering landscaping topics and partnered with the Regional Stormwater Partnership to provide the display and prize wheel with landscaping questions and promotional products at this conference. It is estimated that approximately 100 landscapers visited the display and interacted with CMSWS staff.

*Horizontal Directional Drilling sector:*

During FY2016, CMSWS staff developed and began implementing an outreach plan specific to horizontal directional drilling. A new best practices publication was developed specific for the horizontal directional drilling sector, which was posted online and e-mailed to management personnel of prime contractors doing horizontal drilling work in the area. The remainder of the outreach plan will be conducted during FY2017.

5.5.2 Sanitary Sewer Overflows and Septic Systems

CMSWS works with two separate departments to reduce sources of bacteria from sanitary sewer overflows (SSOs) and septic systems: Charlotte Water (formerly Charlotte-Mecklenburg Utilities) and the Mecklenburg County Groundwater and Wastewater Services.

*Sanitary Sewer Overflows:*

Charlotte Water is the department responsible for operating the water supply and sanitary sewer systems in the City. During FY2016, there were 224 SSOs from the municipal sanitary sewer system. This is an increase of 47 SSOs from FY2015; however, the number of spills per 100 miles of pipe system continued to show a steady decline from FY2007 to FY2016 despite the fact that the City has continued to grow and develop.

The City works to decrease SSOs in four main ways: infrastructure maintenance and inspections, commercial/restaurant/industrial inspections, multi-family residential outreach, and the Grease Free education campaign.

*Infrastructure maintenance and inspection:*

Charlotte Water implements a number of infrastructure maintenance and inspection programs designed to reduce inflow and infiltration and sanitary sewer losses. During FY2016, the following was accomplished:

- 9.5 miles of sewer pipe were rehabilitated, repaired or replaced
- 183 manholes were rehabilitated, repaired or replaced
- 346 miles of sewer pipe were treated with root control chemicals
- 1,277 miles of sewer line were cleaned
- 228 service connections were replaced
- 2,575 work hours of preventative maintenance and twice weekly inspections were performed on 80 lift stations
- 29 miles of rights-of-way were cleared.

*Commercial/ restaurant/industrial pre-treatment inspections:*

During FY2016, Charlotte Water inspected 2,579 grease handling/ food service establishments. Thirty (30) grease traps were installed by businesses as a result of Notices of Deficiency issued by Charlotte Water staff. Educational information about proper disposal of pipe-blocking items was provided to 3,196 customers in apartments and presentations were provided to 2,570 children and adults. Staff also performed compliance inspections at over 250 facilities (called Significant Industrial Users) with wastewater pre-treatment permits. Among the permitted facilities, there were 227 permit limit violations which resulted in enforcement actions.

*Multi-family residential program:*

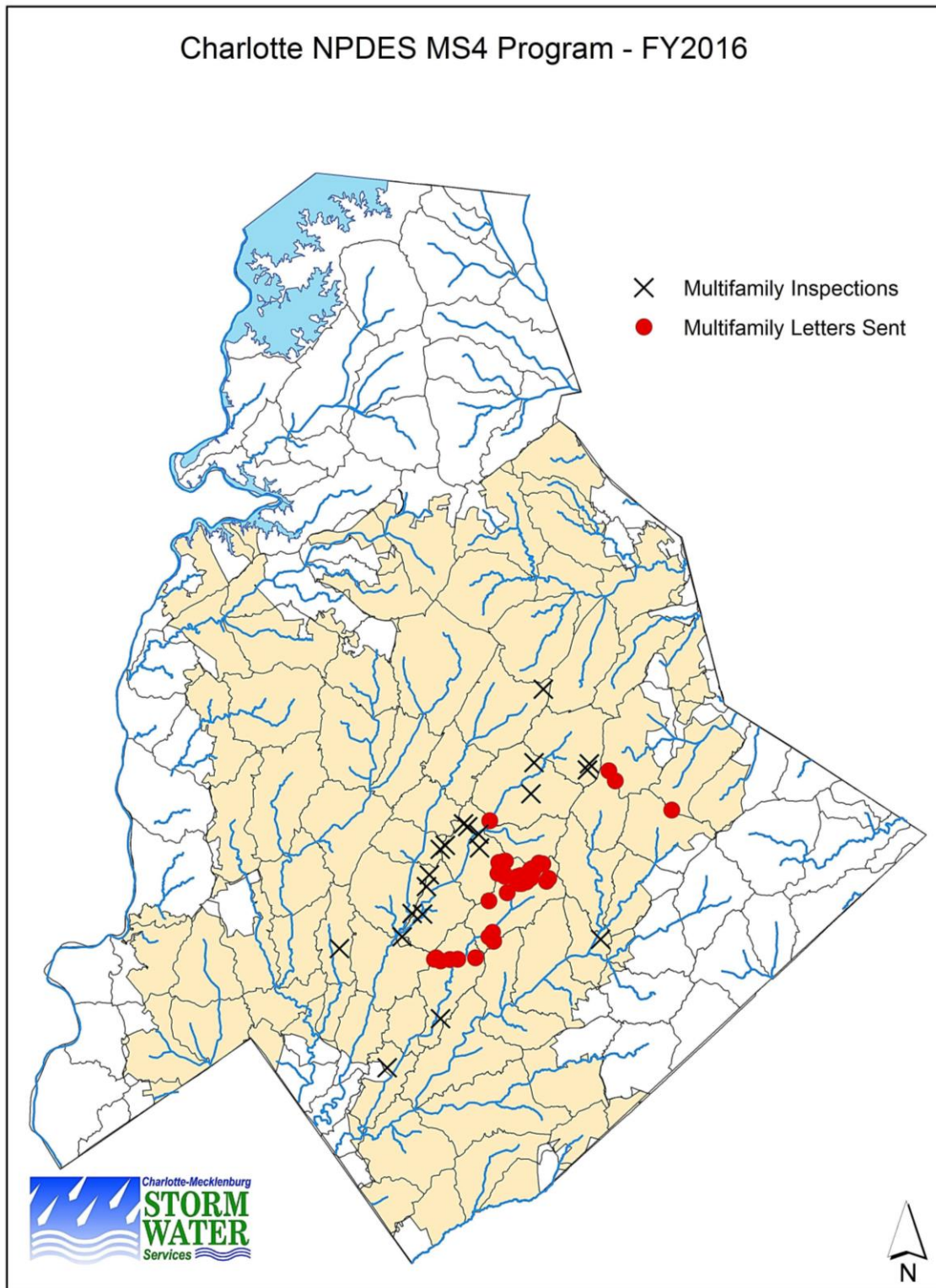
Since 2009, CMSWS has been working with Charlotte Water to prevent SSOs by providing mailings, workshops and inspections for the multi-family residential sector. During FY2016, this program accomplished the following:

- Multi-family residential complexes were prioritized based on monitoring data such as surface water quality and the locations of SSOs and related service requests.
- 100 complexes received informational letters explaining the ten state regulatory requirements for private sanitary sewer collection systems and the resources available from CMSWS and Charlotte Water to comply.
- 23 personnel from multi-family residential complexes attended a training seminar(s) where presentations focus on responsibilities for managing a private sanitary system and the best practices for compliance with state regulations.
- Templates for Operation and Maintenance Plans, sewer system maps and other compliance documents were provided and made available on the City's website.

- 20 compliance inspections were conducted by CMSWS staff at facilities that were sent the informational letter the previous year. The inspections offered facility personal assistance with development of multi-family residential Operation and Maintenance programs.

**Figure 5-8** shows locations of the 100 multi-family complexes targeted for education during FY2016 and the 20 locations inspected for compliance.

**FIGURE 5-8**





### Septic Systems:

The CMSWS works with Mecklenburg County Groundwater and Wastewater Services each year to monitor discharges from septic systems. The County conducts the permitting, inspections, education and enforcement activities related to septic systems and CMSWS reviews this information to look for potential impacts on surface waters.

During FY2016, a total of 26 failing septic systems were discovered in the City of Charlotte, 12 were repaired and 14 were connected to the municipal sanitary sewer. These failures were not localized to a particular area, except seven that were located in the Reedy Creek basin. No follow-up field investigations or monitoring were necessary by CMSWS.

**Figure 5-9** shows locations of septic system failure activities during FY2016 as well as the cumulative locations of septic failures since November 2006.

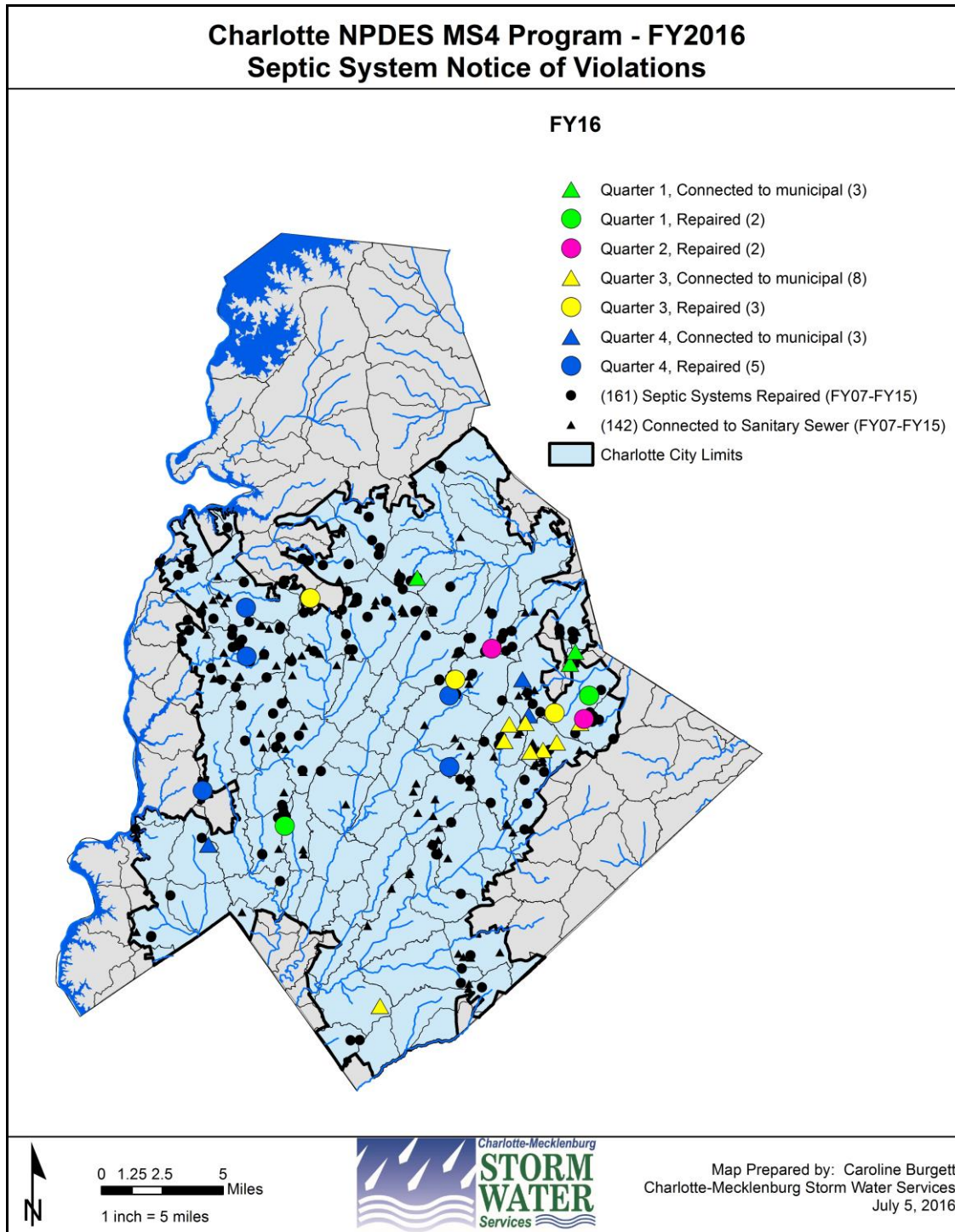
## 5.6 Public Reporting Hotline

The City, in cooperation with Mecklenburg County, continued to operate a joint customer service hotline to get information about a variety of concerns. Citizens were able to dial 311 any time of the day to report pollution, flooding, blockages to the drainage system as well as request other City/County services. CMSWS staff has worked with the customer service group to make sure calls were directed to appropriate personnel and handled in a timely manner. The hotline/help line is discussed further in sub-section 3.6 above.

### 5.6.1 Public Education and Outreach

The City continued to maintain a public education and outreach program to inform businesses, industries and the general public about illicit discharges and improper waste disposal and how they impact the environment. This education and outreach program included instructions regarding the proper method for reporting illicit discharges. A media campaign, website, utility bill inserts, handouts/brochures, public events, and in-person education and training sessions were the primary education and outreach mechanisms. Handouts and brochures were reviewed and revised as necessary and were distributed during the performance of facility inspections, when responding to citizen requests for service, and at event displays. These public education and outreach items for the IDDE Program were included as a component of the Public Education and Outreach Program described in more detail in Section 3.

**FIGURE 5-9**



## 5.7 Documentation and Citizen Service Requests

Service requests continue to be one of the most important sources for detection and elimination of illicit discharges and connections in the City of Charlotte.

During FY2016, a total of 476 service requests related to surface water pollution were investigated. In addition, 43 emergency response situations involving hazardous material releases were investigated, as discussed further in sub-section 8.5. All requests were investigated and follow-up was provided to ensure efforts were taken to remediate the discharge and restore impacted areas. Enforcement activities were implemented as appropriate and are described in more detail in sub-section 5.2.

The City utilizes the “Cityworks” database platform to maintain electronic and hard copy files documenting all IDDE activities including citizen requests. These were tracked from the original call for service, through investigations and enforcement actions, and until final remedial work. The database stores information such as reporting party contact information, date, time, investigator information, pollutant category, investigation reports, monitoring data, photos and attachments, enforcement information, and geo-location.

**Figure 5-10** shows an example of a summary report of a service request activity that can be generated.

**Figure 5-11** shows the FY2016 spatial distribution of service requests and emergency responses within the City of Charlotte.

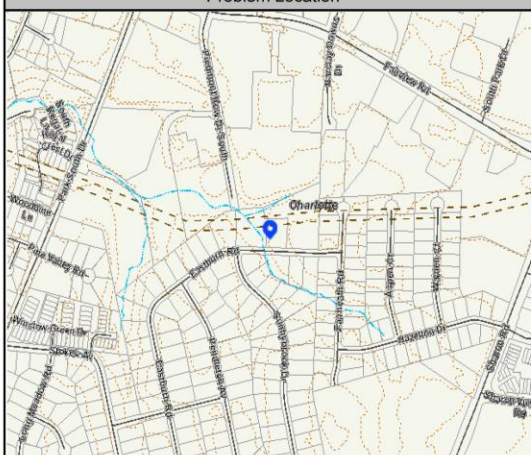
# FIGURE 5-10

(Page 1)



## Service Request Report

700 North Tryon Street  
Charlotte, NC 28202  
Fax: 704.336.4391

General Information	Problem Location	
Request ID: <b>1985</b> Status: CLOSED Emergency: No Initial Call: 2/9/2015 8:38:18AM Initiated By: DECRISTOFARO, ANDREW Date/Time Init: 2/9/2015 8:39:12AM Submit To: MCCULLOCH, JOHN Dispatch To: DECRISTOFARO, ANDREW Closed By: MCCULLOCH, JOHN Date Closed: 2/11/2015 5:01:40PM Closed in 2 days		
<th>Caller Information</th> <td></td>	Caller Information	
Caller: UNKNOWN Address: Phone Number: Customer Notified: No		
<th>Incident Information</th>		Incident Information
<b>Address:</b> 2818 EASTBURN RD Charlotte - (Little Sugar Creek) <b>Type:</b> Sewage in Stream <b>Problems Found:</b> 1 - <b>Resolved:</b> 1 <b>Details:</b> Sewage in the stream at 2800 Eastburn Rd		

Inspections Summary					
Insp. ID: 17592	Insp. Type: General Inspection	Insp. Date: 2/7/2015 3:46:39PM	Customer: Phase1	Inspector: DECRISTOFARO, ANDREW	Attachments 2
Incident type		Discharge/dump			
Media impacted		Stream			
Material released		Sewage - CMU			
Investigation methods used		Physical			
Land use type for activity location		Single-family residential			
Summary: Andrew DeCristofaro investigated a report of sewage in the stream at 2500 Eastburn Rd. The sewage in the stream was tracked upstream, at which point the tributary was piped underground. Sanitary sewer manholes in the area were dye tested for leaks. No dye was found in the stream.					

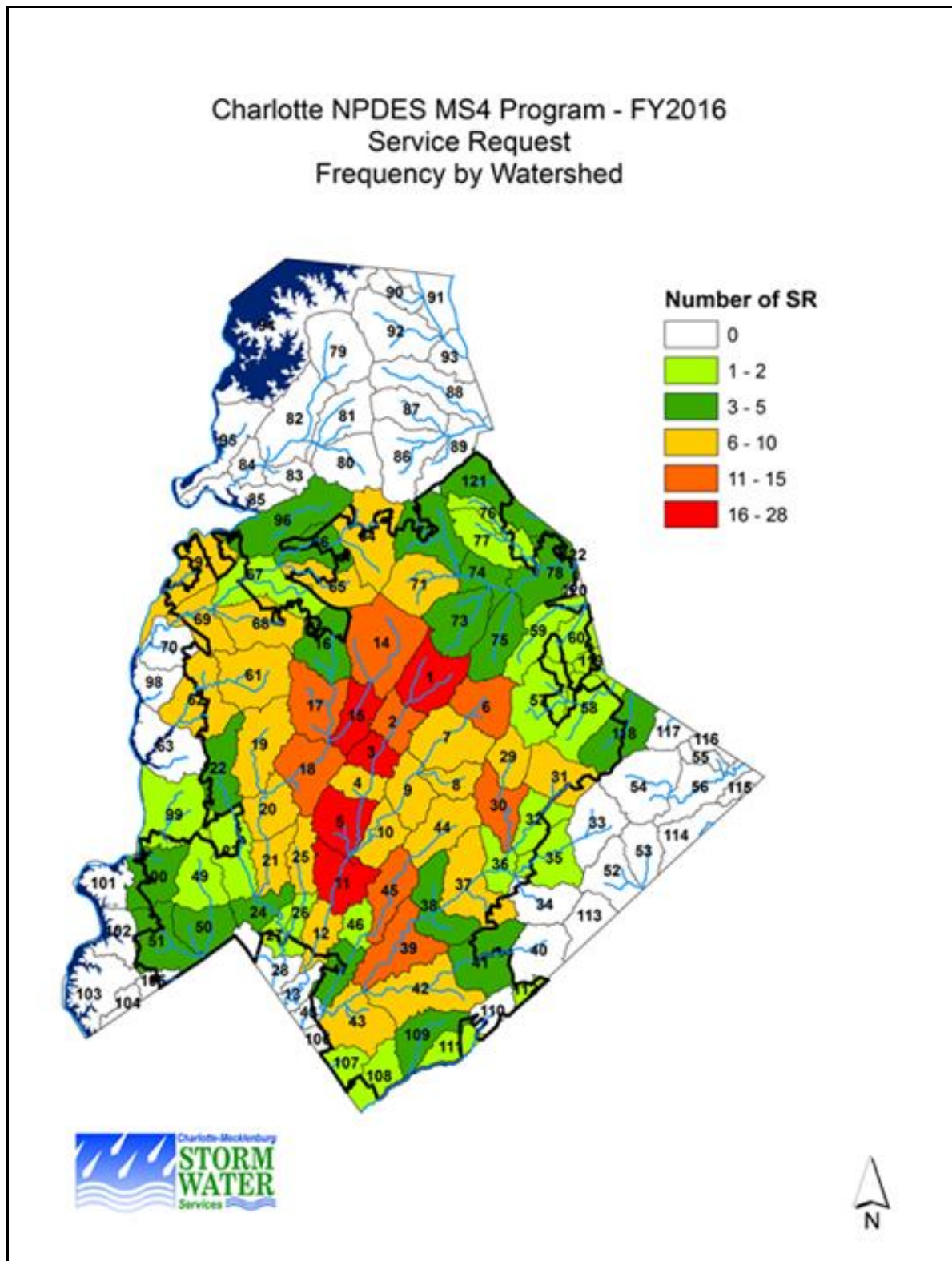
Insp. ID: 17593	Insp. Type: General Inspection	Insp. Date: 2/8/2015 12:44:32PM	Customer: Phase1	Inspector: DECRISTOFARO, ANDREW	Attachments 3
Investigation methods used		Physical			
Summary: Andrew DeCristofaro investigated the sewage in the stream at 2800 Eastburn Rd. Tracking the storm sewer system upstream led to 5100 Sharon Rd. A sanitary sewer manhole behind a residence was overflowing, discharging sewage to the storm sewer system CMUD Dispatch was notified immediately.					

**(Page 2)**

Insp. ID: 17637	Insp. Type: General Inspection	Insp. Date: 2/9/2015 9:23:39AM	Customer: Phase1	Inspector: DECRISTOFARO, ANDREW	Attachments 2
Investigation methods used		Physical			
Summary: Andrew DeCristofaro performed a follow up investigation at 5100 Sharon Rd, Sharon Towers. The sanitary sewer overflow was fixed, and lime was spread over the affected area. No further action needed.					



**FIGURE 5-11**



## 5.8 Measurable Goals/Planned Activities for Future Program Years

**Table 5-2** describes the various Illicit Discharge Detection and Elimination program BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.

**Table 5-2: BMP Measurable Goals for the Illicit Discharge Detection and Elimination Program.**

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Maintain appropriate legal authorities	Maintain adequate ordinances or other legal authorities to prohibit illicit connections and discharges and enforce the approved IDDE Program.	Continue administration and enforcement of the Pollution Control Ordinance and IDDE Program.	Continue administration and enforcement of the Pollution Control Ordinance and IDDE Program.	Continue administration and enforcement of the Pollution Control Ordinance and IDDE Program.	Continue administration and enforcement of the Pollution Control Ordinance and IDDE Program.	Continue administration and enforcement of the Pollution Control Ordinance and IDDE Program.
Maintain a Storm Sewer System Base Map	The permittee shall maintain a current map showing major outfalls and receiving streams.	Continue to maintain storm sewer map in GIS and update as necessary to show additional outfalls.	Continue to maintain storm sewer map in GIS and update as necessary to show additional outfalls.	Continue to maintain storm sewer map in GIS and update as necessary to show additional outfalls.	Continue to maintain storm sewer map in GIS and update as necessary to show additional outfalls.	Continue to maintain storm sewer map in GIS and update as necessary to show additional outfalls.
Inspection / detection program to detect dry weather flows at MS4 outfalls	Maintain written procedures and/or Standard Operating Procedures (SOPs) for detecting and tracing the sources of illicit discharges and for removing the sources or reporting the sources to the State to be properly permitted. Written procedures and/or SOPs shall specify a timeframe for monitoring and how many outfalls and the areas that are to be targeted for inspections.	Maintain and update SOPs for detecting and eliminating illicit discharges and performing outfall inspections. Roughly 20% of identified outfalls will be inspected each year, with extra emphasis on hotspot areas.	Maintain and update SOPs for detecting and eliminating illicit discharges and performing outfall inspections. Roughly 20% of identified outfalls will be inspected each year, with extra emphasis on hotspot areas.	Maintain and update SOPs for detecting and eliminating illicit discharges and performing outfall inspections. Roughly 20% of identified outfalls will be inspected each year, with extra emphasis on hotspot areas.	Maintain and update SOPs for detecting and eliminating illicit discharges and performing outfall inspections. Roughly 20% of identified outfalls will be inspected each year, with extra emphasis on hotspot areas.	Maintain and update SOPs for detecting and eliminating illicit discharges and performing outfall inspections. Roughly 20% of identified outfalls will be inspected each year, with extra emphasis on hotspot areas.
Employee Training	Conduct training for appropriate municipal staff on detecting and reporting illicit connections and discharges.	Maintain an employee training program and conduct employee training.	Maintain an employee training program and conduct employee training.	Maintain an employee training program and conduct employee training.	Maintain an employee training program and conduct employee training.	Maintain an employee training program and conduct employee training.
Maintain a public reporting mechanism	Maintain and publicize reporting mechanism for the public to report illicit connections and discharges. Establish citizen request response procedures.	Maintain the public reporting hotline and publicize through the media outreach campaign.	Maintain the public reporting hotline and publicize through the media outreach campaign.	Maintain the public reporting hotline and publicize through the media outreach campaign.	Maintain the public reporting hotline and publicize through the media outreach campaign.	Maintain the public reporting hotline and publicize through the media outreach campaign.



Documentation	The permittee shall document the date of investigations, any enforcement action(s) or remediation that occurred.	Continue to maintain IDDE program records and databases to accurately document the activities in the program.	Continue to maintain IDDE program records and databases to accurately document the activities in the program.	Continue to maintain IDDE program records and databases to accurately document the activities in the program.	Continue to maintain IDDE program records and databases to accurately document the activities in the program.	Continue to maintain IDDE program records and databases to accurately document the activities in the program.
---------------	--	---	---	---	---	---

## 5.9 Program Assessment

The overall Illicit Discharge Detection and Elimination Program was successfully implemented during the annual report period. The following **Table 5-3** shows a summary of the various items and corresponding data results for activities conducted under the program:

**Table 5-3: Program Summary**

IDDE PROGRAM	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
Stream miles assessed	227	230	209	229		
Watershed sub-basins assessed	19	18	18	21		
Outfalls inspected/inventoried/updated	763	1,364	1,265	820		
Dry weather flows detected	102	240	103	88		
Dry weather flows sampled	59	138	28	15		
Citizen Service Requests received	362	355	432	476		
Emergency Spills responded to	49	31	47	43		
Number of illicit discharges detected	448	578	723	829		
Number of NOV's issued	83	96	86	109		
Enforcements & fines issued	1	3	6	7		
Amount of fines issued (Total Dollars)	3,600	21,189	7,947	24,203		
Staff IDDE training sessions	45	36	39	34		
Number of staff trained on IDDE	1,195	2,206	2,587	965		
Number of SSOs detected/referred	257	247	177	224		
Septic system failures detected/referred	22	38	38	26		

The following is clarification of certain numbers provided in Table 5-3:

- Outfalls inspected/inventoried/updated includes outfalls from stream-walks, IDEP program, and municipal and industrial inspections.
- Dry weather flows detected includes those from outfalls included in the bulleted item above.
- Illicit discharges detected includes those found during service requests (includes ERs and private sewage discharges), SSOs from the public system, IDEP, septic failures, stream-walks, water quality monitoring, and municipal and industrial inspections.
- Employee IDDE training sessions includes classroom sessions (including those conducted under the work plan and by wastewater treatment and airport facilities), number of facilities assigned the online training module, and employee training/outreach events.
- Number of employee staff trained on IDDE includes all those trained during the sessions described in the bulleted item above.
- Number of SSOs include those from both public and private systems.

CMSWS staff conducted a review and analysis of IDDE activities. The purpose was to evaluate the effectiveness of current activities, identify new methods for identifying illicit discharges, and



move forward with program implementation based on the evaluation. As a result of this effort and discussions in previous years, the following are highlights of that evaluation:

- GIS analysis of illicit discharges continues to show that most of them occur in highly urbanized areas of the city. As such, the Hot Spot Investigation program (IDEP) will continue to be implemented as support for the Stream-Walk Program in priority basins.
- Education targeting the landscaping and horizontal directional drilling sectors will continue to build upon efforts started in FY2016 as these sectors continue to be consistent pollution sources.
- Targeting multi-family residential complexes with education and inspections will continue as these complexes are one of the largest sources of SSOs. More inspections at multi-family complexes targeted in previous years will be conducted during FY2017. This is due to the finding during previous inspections that quite a few complexes have not implemented Operation and Maintenance Plans as required by state law.
- The public and internal employee staff continues to be the number one source of illicit discharge reporting. The hotline, public education campaigns, internal education and service request response will continue to be a staple for IDDE efforts.
- The City Works database and use of smart phones for field data entry continues to improve data entry, storage and query capabilities.
- The City of Charlotte's vast and varied surface and stormwater monitoring program continues to be an essential component for finding illicit discharges.

## **Section 6: Construction Site Stormwater Runoff Control Program**

During the annual report period, the Construction Site Stormwater Runoff Control program conducted site evaluations and enforced the local ordinance per the SWMP. The following sub-sections explain activities completed under this program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

### **6.1 BMP Summary Table**

**Table 6-1** provides information concerning the BMPs implemented to fulfill the requirements of the Construction Site Stormwater Runoff Control Program. Funding for the BMPs in this section is covered by local land development fees.

**Table 6-1: BMP Summary Table for the Construction Site Stormwater Runoff Control Program.**

BMP	BMP Description	Schedule (yrs)					Responsible Position
		1	2	3	4	5	
Erosion and Sediment Control Program	The permittee has a delegated Sediment and Erosion Control Program. As such, to the extent authorized by law, the permittee is responsible for compliance with the Sediment Pollution Control Act of 1973 and Chapter 4 of Title 15A of the North Carolina Administrative Code. The delegated Sediment and Erosion Control Program effectively meets the maximum extent practicable (MEP) standard for Construction Site Runoff Controls by permitting and controlling development activities disturbing one or more acres of land surface and those activities less than one acre that are part of a larger common plan of development as authorized under the Sediment Pollution Control Act of 1973 and Chapter 4 of Title 15A of the North Carolina Administrative Code.	X	X	X	X	X	Land Development Division Manager
Develop requirements for construction site operators	The NCG010000 permit establishes requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality, as part of the Permittee's delegated program.	X	X	X	X	X	Land Development Division Manager
Public information and reporting	The permittee shall provide and promote a means for the public to notify the appropriate authorities of observed erosion and sedimentation problems. The permittee may implement a plan promoting the existence of the NCDEQ, Division of Land Resources "Stop Mud" hotline to meet the requirements of this paragraph.	X	X	X	X	X	Land Development Division Manager
Plan reviews	Implement construction site plan reviews as part of the Permittee's delegated program. For new development and redevelopment projects to be built within the permittee's planning jurisdiction by entities with eminent domain authority, the permittee shall, to the maximum extent practicable, coordinate the approval of the construction site runoff control with the Division of Land Resources of NCDEQ.	X	X	X	X	X	Land Development Division Manager

## 6.2 Erosion and Sediment Control Program

The City has operated a soil erosion and sediment control program locally since 1983, which is currently a delegated Sediment and Erosion Control Program under authority granted by the North Carolina Sedimentation Commission. As such, to the extent authorized by law, the City is responsible for compliance with the Sediment Pollution Control Act of 1973 and Chapter 4 of Title 15A of the North Carolina Administrative Code. For FY2016, the program served to

provide added protection to surface water resources in the City by ensuring that builders and developers followed minimum standards for erosion and sediment control per State and Local guidelines. By coupling the authority of a strong local ordinance with the expertise and knowledge of trained erosion control professionals, plan review engineers and construction inspectors, the City worked comprehensively to minimize negative impacts to local waters from construction-related activities.

The Charlotte Soil Erosion and Sedimentation Control ordinance, amended and adopted by City Council in 2008, served as the backbone of the program. Ordinance highlights include the following requirements:

- An approved soil erosion and sediment control plan for all qualifying land disturbances of one acre or greater
- An on-site preconstruction conference prior to the installation of any measures or commencement of land disturbing activities
- Issuance of a grading permit prior to the commencement of land disturbing activities.
- Weekly inspections, at a minimum, by the permit holder of erosion control measures, depending on sensitivity of receiving waters
- Inspections by the permit holder of measures after any rainfall event totaling one-half inch or greater
- Inspections must be conducted by a competent person as defined by the ordinance
- Documentation and maintenance of inspection records performed by the permit holder.
- Maintenance and optimal performance of all measures for the life of the project performed by the permit holder
- Control erosion and trap sediment before it leaves site, to the maximum extent practicable

The ordinance also provides City staff with the following:

- Authority to issue NOVs for practices and/or impacts contravening ordinance requirements
- Authority to issue civil penalties for violations of the Soil & Erosion Control Ordinance

#### 6.2.1 Inspection and Enforcement Procedures

All construction sites that required a preconstruction meeting and approved plan were logged, filed and placed in the queue for regular inspections. Staff goals were to visit and inspect every logged site utilizing a scheduled inspection process. Sites that generated citizen complaints, had a history of non-compliance, or were in close proximity to a critical area (e.g., sites adjacent to water features or within a water-supply watershed) were considered a priority for additional inspections and follow-up.

In most cases, first time violations detected that did not produce offsite sedimentation resulted in the issuance of a written NOV or an Inspection Report to the Violator. The Violator was given a

list of necessary corrective actions and a specified period of time to correct any violations before receiving a follow-up compliance inspection.

In addition, more serious violations that incurred a civil penalty with no specified time for compliance included:

- Grading without a permit
- Repeated violations, or non-compliance with the corrective actions detailed in a NOV
- Gross or malicious violations
- Off-site sedimentation
- Sedimentation into a lake, stream, creek, pond, river, wetland or other water feature

### 6.3 Construction Site Requirements

The program required that all land disturbing activities comply with ordinance requirements for controlling erosion and sediment on site. As an additional requirement, and in compliance with NPDES Phase II regulations, all construction sites one acre or greater were required to have an approved soil erosion and sediment control plan designed specifically for the site under development that met the minimum requirements, as required by NPDES General Construction Permit NCG010000. The requirements guided design engineers and land developers on appropriate measures depending on site conditions, drainage areas, and total amount of land to be disturbed and proximity to surface waters and critical areas. After plan approval, land developers were required to follow the approved plan for all phases of construction as well as maintain measures in a state that ensured optimal performance throughout the duration of construction activities and until final site stabilization was achieved. Regular inspections were a requirement for optimal performance and all sites had to employ a competent person to conduct the inspections and maintain logbooks and documentation for ready-review by local or state representatives.

### 6.4 Public Information and Reporting

The City's Erosion Control Program maintained a website to assist with the dissemination of information to the development community and the general public. The City also maintained an informational hotline/help line (311) that served as a clearinghouse for general information, and ensured that erosion control related issues were directed to appropriate staff for resolution. The 311 hotline/help line is discussed further in sub-section 3.6 above. Information sharing and inter-department training between City and County agencies also ensured that problems, questions, or requests for information from the general public were processed and resolved quickly. The City's erosion control webpage can be viewed at:  
<http://charlottenc.gov/ld/Pages/default.aspx>

#### 6.4.1 Education and Training Materials

The City maintained an education and training program for developers, contractors and other interested parties within the region. Although program policies and procedures dictated that self-

inspectors maintain a level of competence necessary to ensure compliance, the City took a proactive role in providing local training and handout materials for affected parties. In a cooperative effort with Mecklenburg County, the City of Charlotte maintained the Charlotte-Mecklenburg Certified Site Inspector (CMCSI) training program, which has to date provided training to over 5,500 individuals since its inception in 2003. CMCSI is a full day training course that provides attendees with an understanding of the importance of water resources to our community, the local and state requirements for controlling construction site runoff, principles of erosion control, common site problems, recommendations for conducting effective inspections, and a certification exam. The CMCSI program was offered three times during FY2016, providing training to 425 people (see **Table 6-2**).

In addition to the CMCSI education program, all developers, builders and responsible parties received handouts and materials at preconstruction meetings and at other times as necessary to explain ordinance requirements, minimum standards and other relevant information for the financially responsible party and/or site operators.

**Table 6-2: CMCSI Training Program Dates and Attendance – FY2016**

<b>Date</b>	<b>Registered</b>	<b>Attended</b>
08/27/15	196	171
01/20/16	160	142
05/24/16	140	112
<b>Totals</b>	<b>496</b>	<b>425</b>

## 6.5 Plan Reviews

Any land disturbing activity consisting of one acre or greater was required to obtain plan approval of the soil erosion and sediment control plan prior to scheduling a preconstruction conference. When plans were submitted by design engineers, erosion control staff conducted the review and approval of the erosion control portion of the plans. All local erosion control staff were required to obtain and maintain status as a Certified Professional in Erosion and Sediment Control (CPESC) which provided accreditation for plan design and review. Plans were reviewed for suitability of selected measures and to ensure that design parameters and calculations were appropriately employed and minimum standards were achieved.

## 6.6 Measurable Goals/Planned Activities for Future Program Years

**Table 6-3** describes the various Construction Site Stormwater Runoff Control BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.



**Table 6-3: BMP Measurable Goals for the Construction Site Stormwater Runoff Control Program.**

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Erosion and Sediment Control Program	The permittee has a delegated Sediment and Erosion Control Program. As such, to the extent authorized by law, the permittee is responsible for compliance with the Sediment Pollution Control Act of 1973 and Chapter 4 of Title 15A of the North Carolina Administrative Code. The delegated Sediment and Erosion Control Program effectively meets the maximum extent practicable (MEP) standard for Construction Site Runoff Controls by permitting and controlling development activities disturbing one or more acres of land surface and those activities less than one acre that are part of a larger common plan of development as authorized under the Sediment Pollution Control Act of 1973 and Chapter 4 of Title 15A of the North Carolina Administrative Code.	Continue to implement the delegated Sediment and Erosion Control program and enforce the City ordinance.	Continue to implement the delegated Sediment and Erosion Control program and enforce the City ordinance.	Continue to implement the delegated Sediment and Erosion Control program and enforce the City ordinance.	Continue to implement the delegated Sediment and Erosion Control program and enforce the City ordinance.	Continue to implement the delegated Sediment and Erosion Control program and enforce the City ordinance.
Develop requirements for construction site operators	The NCG010000 permit establishes requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality, as part of the Permittee's delegated program.	Continue requirements for BMPs and waste control through issuance of General Construction Permit NCG010000	Continue requirements for BMPs and waste control through issuance of General Construction Permit NCG010000	Continue requirements for BMPs and waste control through issuance of General Construction Permit NCG010000	Continue requirements for BMPs and waste control through issuance of General Construction Permit NCG010000	Continue requirements for BMPs and waste control through issuance of General Construction Permit NCG010000
Public information and reporting	The permittee shall provide and promote a means for the public to notify the appropriate authorities of observed erosion and sedimentation problems. The permittee may	Continue to maintain reporting hotline and website.	Continue to maintain reporting hotline and website.	Continue to maintain reporting hotline and website.	Continue to maintain reporting hotline and website.	Continue to maintain reporting hotline and website.



	implement a plan promoting the existence of the NCDENR, now NCDEQ, Division of Land Resources “Stop Mud” hotline to meet the requirements of this paragraph.					
Plan reviews	Implement construction site plan reviews as part of the Permittee’s delegated program. For new development and redevelopment projects to be built within the permittee’s planning jurisdiction by entities with eminent domain authority, the permittee shall, to the maximum extent practicable, coordinate the approval of the construction site runoff control with the Division of Land Resources of DENR.	Continue plan reviews to ensure program requirements are met. Coordinate with NCDEQ – DEMLR as necessary.	Continue plan reviews to ensure program requirements are met. Coordinate with NCDEQ – DEMLR as necessary.	Continue plan reviews to ensure program requirements are met. Coordinate with NCDEQ – DEMLR as necessary.	Continue plan reviews to ensure program requirements are met. Coordinate with NCDEQ – DEMLR as necessary.	Continue plan reviews to ensure program requirements are met. Coordinate with NCDEQ – DEMLR as necessary.

## 6.7 Program Assessment

The overall Construction Site Stormwater Runoff Control Program was successfully implemented during the annual report period. The following **Table 6-4** shows a summary of the various items and corresponding data results for activities conducted under the program:

**Table 6-4: Program Summary**

CONSTRUCTION SITE RUNOFF PROGRAM	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
Number of education workshops conducted	3	3	3	3		
Number of attendees at workshops	307	356	367	425		
Number of project/site plans reviewed	823	1,048	1,043	711		
Number of erosion Citizen Requests received	131	275	~300	~375		
Number of site inspections conducted	3,142	2,852	2,323	2,948		
Number of NOV's issued	38	50	47	109		
Number of Enforcements conducted	24	40	32	41		
Amount of fines issued (Total Dollars)	13,700	48,500	51,000	99,100		

## Section 7: Post-Construction Stormwater Management Program

During the annual report period, the City conducted implementation of its Post-Construction Stormwater Management (PCSM) program in accordance with the Post-Construction Stormwater Ordinance (PCSO) and program administrative manual. The following sub-sections explain activities completed under this program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

### 7.1 BMP Summary Table

**Table 7-1** provides information concerning the BMPs to be implemented to fulfill the requirements of the Post-Construction Stormwater Management Program. Funding for the BMPs in this section is covered by local stormwater utility fees and land development fees.

**Table 7-1: BMP Summary Table for the Post-Construction Stormwater Management Program.**

BMP	BMP Description	Schedule (yrs)					Responsible Position
		1	2	3	4	5	
Post-Construction Stormwater Management Program	Maintain an ordinance (or similar regulatory mechanism) and program to address stormwater runoff from new development and redevelopment.	X	X	X	X	X	Water Quality Program Manager
Strategies which include BMPs appropriate for the MS4	Maintain strategies that include a combination of structural and/or non-structural BMPs implemented in concurrence with ordinance above. Provide a mechanism to require long-term operation and maintenance of structural BMPs. Require annual inspection reports of permitted structural BMPs	X	X	X	X	X	Water Quality Program Manager

	<p>performed by a qualified professional.</p> <p>A qualified professional means an individual trained and/or certified in the design, operation, inspection and maintenance aspects of the BMPs being inspected, for example, someone trained and certified by NC State for BMP Inspection &amp; Maintenance.</p>						
Deed Restrictions and Protective Covenants	The permittee shall provide mechanisms such as recorded deed restrictions and protective covenants so that development activities maintain the project consistent with approved plans.	X	X	X	X	X	Water Quality Program Manager
Operation and Maintenance Plan	The developer shall provide the permittee with an operation and maintenance plan for the stormwater system, indicating the operation and maintenance actions that shall be taken, specific quantitative criteria used for determining when those actions shall be taken, and who is responsible for those actions. The plan must clearly indicate the steps that shall be taken and who shall be responsible for restoring a stormwater system to design specifications if a failure occurs and must include an acknowledgment by the responsible party. Development must be maintained consistent with the requirements in the approved plans and any modifications to those plans must be approved by the Permittee.	X	X	X	X	X	Water Quality Program Manager
Educational materials and training for developers	Provide educational materials and training for developers. New materials may be developed by the permittee, or the permittee may use materials adopted from other programs and adapted to the permittee's new development and redevelopment program.	X	X	X	X	X	Water Quality Program Manager

## 7.2 Post-Construction Stormwater Management Program

The City began development of its Post-Construction Stormwater Management (PCSM) program in 2004 with participation in a Charlotte-Mecklenburg Stormwater Stakeholders Group. The group consisted of representatives from the development and environmental communities as well as local government staff. The stakeholders were charged with making recommendations to the City and County for the development of their respective post-construction ordinances. During 2006-07, the City worked to develop the ordinance, which was approved by City Council on November 26, 2007, effective July 1, 2008. In October 2011, the City Council approved revisions to the ordinance; primarily the allowance of a mitigation fee for re-development where no increase in impervious coverage above 20,000 ft<sup>2</sup> occurs, requiring minimum buffers for all projects, and making minor text changes that did not affect the governance of the ordinance. In

April 2014, City Council approved an additional time extension of the October 2011 revisions until October 31, 2014. In March 2016, City Council approved a permanent ordinance revision to a modified version of the October 2011 revisions based on a stakeholder consensus agreement.

The ordinance and post-construction program are designed to meet the stormwater management and water quality protection requirements of NCGA Session Law 2006-246, as promulgated in North Carolina Administrative Code at 15A 02H Sections .0126, .0150 - .0154 (NPDES). The ordinance and program are also designed to meet 15A 02H Section .1000 (Stormwater Management) to address post-construction runoff from new development and redevelopment projects as required by the NPDES MS4 permit program and as specified and defined in the City's Post-Construction Stormwater Ordinance (PCSO). The ordinance covers the entire jurisdictional area of the City. As part of the program, an administrative manual has been developed to ensure successful implementation of the program.

### 7.3 Post-Construction BMP Strategies

BMP strategies for the City's Post-Construction Stormwater Management (PCSM) program consisted mainly of structural BMPs such as sand filters, wet ponds, wetlands, and bioretention areas. Structural BMPs and design procedures were detailed in a local BMP manual developed by the City and County. Structural BMPs were required on projects that had 24% or greater built upon area as defined by the program. This threshold was reduced to 10 -12% built upon area for developments disturbing more than an acre and/or adding more than 20,000 sf of built upon area in sensitive watersheds as defined by the ordinance. In addition, structural BMPs were required to be designed to remove 85% of Total Suspended Solids (TSS) for the runoff volume generated from the first one-inch of rainfall, and control the runoff volume from the one-year – 24 hour storm event, and control the peak flow from the 10 and 25-year storm events for residential and commercial development. The program also required proper operation, maintenance, and inspection of BMPs as discussed in later sub-sections. In addition, green infrastructure practices such as rain gardens, pervious pavements, vegetated conveyances, and rain water harvesting were allowed depending on development needs. Undisturbed natural areas, natural resource protection, and tree preservation requirements were part of the program. Also included were requirements for 70% Total Phosphorus removal in certain watersheds, various buffer requirements and widths from 30 – 200 feet based on stream jurisdictional determination, and design standards depending on watershed location and sensitivity. All of these requirements combined make a much more sound and protective ordinance and program than what is minimally required.

### 7.4 Deed Restrictions and Protective Covenants

As part of the PCSM program, the City required deed restrictions and protective covenants to ensure that development projects remained consistent with approved plans. Streams and buffer boundaries were required to be specified on all surveys and record plats. An operation and maintenance agreement for structural BMPs was required to be referenced on record plats and recorded in deeds. In addition, a maintenance easement was required to be recorded to provide access to structural BMPs.



#### 7.4.1 Setbacks for Built-Upon Areas

The PCSM program required a minimum 30-foot buffer on all perennial and intermittent streams draining less than 50 acres and required incrementally increased buffer widths up to 100 feet for streams draining 640 acres or more. A special provision in the program required 200-foot buffers on all perennial streams and 100-foot buffers on all intermittent streams in the Six Mile Creek watershed due to the potential presence of an endangered mussel species. These buffers were recorded on record plats as noted in sub-section 7.4.

#### 7.5 Operation and Maintenance Plan

The PCSM program required the execution of an operation and maintenance agreement between the City and the responsible party (owner) of each BMP. As part of the program, the owner was required to conduct annual inspections of BMPs, maintain proper records documenting operation and maintenance activities, and submit inspection reports to the City. In the case of single family residential projects only, the City will assume the responsibility for operating, maintaining, and inspecting required structural BMPs after an initial two-year observation period.

#### 7.6 Education and Training Program

The City developed and implemented an education and training program designed to provide developers and designers with the information necessary to comply with the PCSO ordinance. Training included information on overall ordinance requirements; review processes; land development and BMP design requirements; deed restrictions and protective covenants; set-back and buffer requirements; and operation, maintenance, and inspection requirements for structural BMPs. In addition, educational information was provided on the City's website. During FY2016, education and training was accomplished by providing the following:

- Website information
- Individual meetings with developers and designers
- Presentations at public meetings
- PCSO training workshop on November 17, 2015

#### 7.7 Measurable Goals/Planned Activities for Future Program Years

**Table 7-2** describes the various Post-Construction Stormwater Management Program BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.

**Table 7-2: BMP Measurable Goals for the Post-Construction Stormwater Management Program.**

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Post-Construction Stormwater Management Program	Maintain an ordinance (or similar regulatory mechanism) and program to address stormwater runoff from new development and redevelopment.	Maintain the City's Post-Construction Ordinance (PCSO) and implement and enforce the ordinance.	Maintain the City's Post-Construction Ordinance (PCSO) and implement and enforce the ordinance.	Maintain the City's Post-Construction Ordinance (PCSO) and implement and enforce the ordinance.	Maintain the City's Post-Construction Ordinance (PCSO) and implement and enforce the ordinance.	Maintain the City's Post-Construction Ordinance (PCSO) and implement and enforce the ordinance.
Strategies which include BMPs appropriate for the MS4	<p>Maintain strategies that include a combination of structural and/or non-structural BMPs implemented in concurrence with (a) above. Provide a mechanism to require long-term operation and maintenance of structural BMPs. Require annual inspection reports of permitted structural BMPs performed by a qualified professional.</p> <p>A qualified professional means an individual trained and/or certified in the design, operation, inspection and maintenance aspects of the BMPs being inspected, for example, someone trained and certified by NC State for BMP Inspection &amp; Maintenance.</p>	Continue PCSM program and ensuring proper BMP operation, maintenance, and annual inspections.	Continue PCSM program and ensuring proper BMP operation, maintenance, and annual inspections.	Continue PCSM program and ensuring proper BMP operation, maintenance, and annual inspections.	Continue PCSM program and ensuring proper BMP operation, maintenance, and annual inspections.	Continue PCSM program and ensuring proper BMP operation, maintenance, and annual inspections.
Deed Restrictions and Protective Covenants	The permittee shall provide mechanisms such as recorded deed restrictions and protective covenants so that development activities maintain the project consistent with approved plans.	Continue to implement Deed Restrictions and Protective Covenants through administration of the PCSM	Continue to implement Deed Restrictions and Protective Covenants through administration of the PCSM Program.	Continue to implement Deed Restrictions and Protective Covenants through administration of the PCSM Program.	Continue to implement Deed Restrictions and Protective Covenants through administration of the PCSM Program.	Continue to implement Deed Restrictions and Protective Covenants through administration of the PCSM Program.



		Program.				
Operation and Maintenance Plan	The developer shall provide the permittee with an operation and maintenance plan for the stormwater system, indicating the operation and maintenance actions that shall be taken, specific quantitative criteria used for determining when those actions shall be taken, and who is responsible for those actions. The plan must clearly indicate the steps that shall be taken and who shall be responsible for restoring a stormwater system to design specifications if a failure occurs and must include an acknowledgment by the responsible party. Development must be maintained consistent with the requirements in the approved plans and any modifications to those plans must be approved by the Permittee.	Continue to implement BMP operation, maintenance, and inspection plan and procedures.	Continue to implement BMP operation, maintenance, and inspection plan and procedures.	Continue to implement BMP operation, maintenance, and inspection plan and procedures.	Continue to implement BMP operation, maintenance, and inspection plan and procedures.	Continue to implement BMP operation, maintenance, and inspection plan and procedures.
Educational materials and training for developers	Provide educational materials and training for developers. New materials may be developed by the permittee, or the permittee may use materials adopted from other programs and adapted to the permittee's new development and redevelopment program.	Continue to provide and update education/training tools for developers.	Continue to provide and update education/training tools for developers.	Continue to provide and update education/training tools for developers.	Continue to provide and update education/training tools for developers.	Continue to provide and update education/training tools for developers.

## 7.8 Program Assessment

The overall Post-Construction Stormwater Management Program was successfully implemented during the annual report period. The following **Table 7-3** shows a summary of the various items and corresponding data results for activities conducted under the program:

**Table 7-3: Program Summary**

POST-CONSTRUCTION PROGRAM	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
Number of site plans reviewed	57	96	103	121		
Number of BMPs added	38	97	109	151		
Number of BMP inspections	27	93	606 <sup>1</sup>	726 <sup>1</sup>		
Number of NOV and CARs issued	10	6	258 <sup>2</sup>	415 <sup>2</sup>		
Number of training sessions	1	4	5	2		
Number of people receiving training	18	105	183	194		

1. Includes Post-Construction and Peak Detention BMPs
2. “NOVs issued” includes Corrective Action Requests (CARs) and letters to remind the property owner that a yearly inspection report is due

## **Section 8: Pollution Prevention/Good Housekeeping Program**

During the annual report period, inspection, training, and program development activities were conducted for municipal facilities and operations as part of the Pollution Prevention and Good Housekeeping Program per the SWMP. The following sub-sections explain activities completed under this program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

### 8.1 BMP Summary Table

**Table 8-1** provides information concerning the BMPs implemented to fulfill the requirements of the Pollution Prevention & Good Housekeeping Program. Funding for the BMPs in this section is covered by local stormwater utility fees.

**Table 8-1: BMP Summary Table for the Pollution Prevention/Good Housekeeping Program.**

BMP	BMP Description	Schedule (yrs)					Responsible Position
		1	2	3	4	5	
Operation and maintenance program for municipal facilities and operations.	Maintain and implement an operation and maintenance program for municipal facilities owned and operated by the permittee that have been determined by the permittee to have significant potential for generating polluted stormwater runoff that has the ultimate goal of preventing or reducing pollutant runoff.	X	X	X	X	X	Water Quality Program Manager
Site Pollution Prevention Plans for municipal facilities	Maintain and implement Site Pollution Prevention Plans for municipal facilities owned and operated by the permittee that have been determined by the	X	X	X	X	X	Water Quality Program

and operations.	permittee to have significant potential for generating polluted stormwater runoff that has the ultimate goal of preventing or reducing pollutant runoff.						Manager
Inspection and evaluation of municipal facilities and operations.	Maintain an inventory of municipal facilities and operations owned and operated by the permittee that have been determined by the permittee to have significant potential for generating polluted stormwater runoff, including the MS4 system and associated structural BMPs, conduct inspections at facilities and operations owned and operated by the permittee for potential sources of polluted runoff, the stormwater controls, and conveyance systems, and evaluate the sources, document deficiencies, plan corrective actions, implement appropriate controls, and document the accomplishment of corrective actions.	X	X	X	X	X	Water Quality Program Manager
Spill Response Procedures municipal facilities and operations.	Maintain spill response procedures for municipal facilities and operations owned and operated by the permittee that have been determined by the permittee to have significant potential for generating polluted stormwater runoff.	X	X	X	X	X	Water Quality Program Manager
Prevent or Minimize Contamination of Stormwater Runoff from all areas used for Vehicle and Equipment Cleaning	Describe measures that prevent or minimize contamination of the stormwater runoff from all areas used for vehicle and equipment cleaning, including fire stations that serve more than three fire trucks and ambulances. Perform all cleaning operations indoors, cover the cleaning operations, ensure wash water drains to the sanitary sewer system, collect stormwater runoff from the cleaning area and providing treatment or recycling, or other equivalent measures. If sanitary sewer is not available to the facility and cleaning operations take place outdoors, the cleaning operations shall take place on grassed or graveled areas to prevent point source discharges of the wash water into the storm drains or surface waters.  Where cleaning operations cannot be performed as described above and when operations are performed in the vicinity of a storm drainage collection system, the drain is to be covered with a portable drain cover during cleaning activities. Any excess standing water shall be removed and	X	X	X	X	X	Water Quality Program Manager



	properly handled prior to removing the drain cover.  Facilities that serve three or fewer fire trucks and ambulances and that cannot comply with these requirements shall incorporate structural measures during facility renovation.						
Streets, roads, and public parking lots maintenance	The permittee shall evaluate BMPs to reduce polluted stormwater runoff from municipally-owned streets, roads, and public parking lots within the corporate limits. Within 12 months of permit issuance, the permittee must update its Stormwater Plan to include the BMPs selected.	X					Water Quality Program Manager
Streets, roads, and public parking lots maintenance	Within 24 months of permit issuance, the permittee must implement BMPs selected to reduce polluted stormwater runoff from municipally-owned streets, roads, and public parking lots identified by the permittee in the Stormwater Plan.		X	X	X	X	Water Quality Program Manager
Operation and Maintenance (O&M) for municipally-owned or maintained structural stormwater BMPs and the storm sewer system (including catch basins, the conveyance system, and structural stormwater controls).	Within 12 months of permit issuance, the permittee shall develop and implement an operation and maintenance program for structural stormwater BMPs and the storm sewer system (including catch basins, the conveyance system, and structural stormwater controls).	X	X	X	X	X	Water Quality Program Manager
Staff training	Maintain and implement a training plan that indicates when, how often, who is required to be trained and what they are to be trained on.	X	X	X	X	X	Water Quality Program Manager

## 8.2 Operation and Maintenance Program

The City continues to provide an extensive network of municipal operations designed to serve its citizens and keep vital infrastructure functioning properly. A number of these operations impact the storm sewer system directly, such as storm sewer system maintenance and street sweeping, and indirectly, such as landscape management and municipal building maintenance. The cumulative impact of all these operations on the storm sewer system is potentially significant, so it is important to maintain operation and maintenance programs.

EPM-Storm Water Services continues to work with various operations to implement best management practices to minimize negative impacts to the storm drain system. This has been

accomplished through a process of observing field observations, updating best management practices and SOPs, and training employees. Stormwater protection best practices have been developed for a total of ten field operations as follows:

- Central Business District Maintenance Operations
- Landscape Management
- Facility Maintenance
- Road, Sidewalk and Facility Construction
- Street Sweeping
- Street Maintenance
- Water/Wastewater Utility Maintenance & Repair
- Traffic Engineering Operations
- Transit Amenities Maintenance
- Hazardous Materials Operations

During FY2016, CMSWS staff worked to develop and implement recommendations to improve pollution prevention practices at CMSWS construction projects. Activities included developing a standard for staff training on sedimentation and erosion control, requirements for certified contractor inspectors for construction projects with NPDES permit inspection requirements, and development of a sedimentation and erosion control review process for minor projects. Work will continue during FY2017 to implement these and other recommendations. Operation and maintenance of the municipal stormwater system is discussed separately in sub-section 8.8.

Operation and maintenance of municipal facilities was managed through implementation of Stormwater Pollution Prevention Plans and a municipal facility inspection program. Those programs are discussed below in sub-sections 8.3, 8.4, 8.5 and 8.9.

### 8.3 Facility Stormwater Pollution Prevention Plans

Stormwater Pollution Prevention Plans (SWPPPs) for all facilities listed in **Table 8-2** continue to be reviewed and updated. The SWPPPs are used as an implementation guide for maintaining good housekeeping and reducing stormwater pollution. All appropriate topics are covered in the SWPPPs including best management practices, monitoring, training, inspections, spill prevention/response, vehicle/equipment cleaning and fueling, and preventative maintenance. All documentation is kept in the SWPPPs, including a site map.

**Table 8-2:** Municipal Sites Included in the Pollution Prevention/Good Housekeeping Program.

Facility	Physical Address
Charlotte-Douglas International Airport	5501 Josh Birmingham Pkwy., Charlotte, NC 28208
CATS Bus Maintenance Operations Facility	3145 S. Tryon St., Charlotte, NC 28217
CATS Transit Maintenance Operations Center	901 N. Davidson St., Charlotte, NC 28202
CATS Transit Center	310 E. Trade St., Charlotte, NC 28202

CATS Light Rail Maintenance Facility	3305 Pelton St., Charlotte, NC
CDOT - Traffic Engineering Operations Center	3701 Craig Ave., Charlotte, NC 28211
CDOT – Street Maintenance Division - Northwest District	4411 Northpointe Industrial Blvd., Charlotte, NC 28216
CDOT – Street Maintenance Division - Northeast District	6001 General Commerce Dr., Charlotte, NC 28213
CDOT – Street Maintenance Division - Southwest District	4600 Sweden Rd., Charlotte, NC 28273
Charlotte Water Department - Irwin Creek WWTP	4000 Westmont Dr., Charlotte, NC 28217
Charlotte Water Department - Mallard Creek WWTP	12400 Hwy 29 N, Charlotte, NC 28262
Charlotte Water Department - McAlpine Creek WWTP & Zone 3 Water/Wastewater Operations	12701 Lancaster Hwy, Pineville, NC 28134
Charlotte Water Department - McDowell Creek WWTP	4901 Neck Rd., Huntersville, NC 28078
Charlotte Water Department - Sugar Creek WWTP	5301 Closeburn Rd., Charlotte, NC 28210
Charlotte Water Department - Franklin WTP	5200 Brookshire Blvd, Charlotte, NC 28216
Charlotte Water Department - Lee S Dukes WTP	7980 Babe Stillwell Rd., Huntersville, NC 28078
Charlotte Water Department - Vest WTP	820 Beatties Ford Rd., Charlotte, NC 28216
Charlotte Water Department – Zone 1 Water/Wastewater Field Operations	11609 Hord Dr., Huntersville, NC 28078
Charlotte Water Department – Zone 2 Water/Wastewater Field Operations	5730 General Commerce Dr., Charlotte, NC 28213
Charlotte Water Department – Zone 4 Water/Wastewater Field Operations	4100 W. Tyvola Rd., Charlotte, NC 28208
Charlotte Water Department – Catawba Pump Station	12548 Pump Station Rd., Charlotte, NC 28216
Financial & Management Services - Heavy Equipment Shop	4600 Sweden Rd., Charlotte, NC 28273
Financial & Management Services - Heavy Truck Shop / Central Yard Truck Wash	829 Louise Ave., Charlotte, NC 28204
Financial & Management Services - Light Vehicle Shop	1031 Atando Ave., Charlotte, NC 28216
Financial & Management Services - Small Engine Repair Shop	701 Tuckaseegee Rd., Charlotte, NC 28208
CFD - Fire Logistics	1200 Otts St., Charlotte, NC 28205
CMPD - Animal Control Shelter	8315 Byrum Dr., Charlotte, NC 28217
Police and Fire Training Academy	1770 Shopton Rd., Charlotte, NC 28217
Solid Waste Services - Street Sweeper Facility & Sanitation Packer Lot	829 Louise Ave., Charlotte, NC 28204
Landscape Management Operations	701 Tuckaseegee Rd., Charlotte, NC 28208

#### 8.4 Facility Inventory and Site Inspections

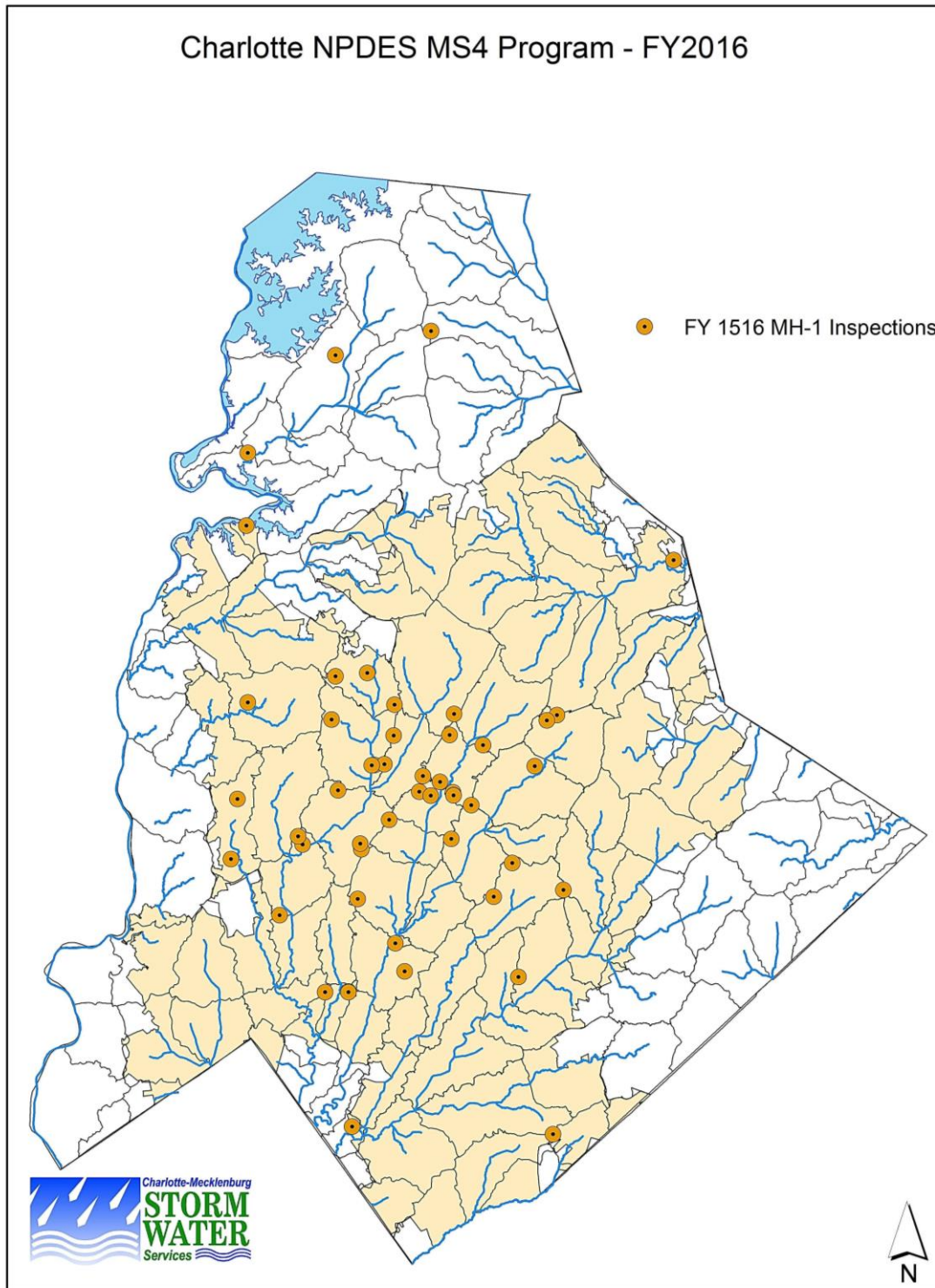
All parcels of land owned or operated by the City continue to be examined to determine whether to include them in the inventory of sites for the Municipal Pollution Prevention and Good Housekeeping program. Being included in the final inventory means that the facility is inspected regularly, has a SWPPP prepared and implemented, and their employees are trained on a regular basis (among other activities). The Standard Administrative Procedure for the Municipal Facilities Inventory is followed when evaluating parcels for inventory purposes.

A total of 50 inspections were conducted as described in the Municipal Inspections and Monitoring SAP. They included the 30 facilities listed in Table 8-2 as well as 20 fire stations, which represents half of all fire stations (each is inspected once every 5 years; the other half will be done during FY2017). **Figure 8-1** shows the locations of the facilities inspected during FY2016. The following are elements of facility inspections:

- Thorough assessment of facility operations and maintenance activities
- Evaluation of waste disposal and storage methods
- Evaluation of the stormwater drainage system, including catch basin inlets, structural best management practices and outfalls
- Review of spill response and clean up procedures with recommended revisions as appropriate
- Evaluation of housekeeping practices with recommended revisions as necessary to eliminate potential pollution sources
- Evaluation of outdoor storage facilities and recommendations for elimination of potential pollution sources
- Identification and elimination of dry weather discharges
- Review of Stormwater Pollution Prevention Plans where applicable including effluent monitoring (if required by permit)
- Completion of a written report documenting findings and recommendations

Five illicit discharges were detected during the inspections. Follow-up inspections, communication and meetings with appropriate personnel were conducted as necessary to eliminate potential pollution sources. The supervisor and other management personnel of each facility were contacted and provided with a copy of the written report.

**FIGURE 8-1**



#### 8.4.1 NPDES Stormwater Permitted Municipal Facilities Review

Eleven (11) City facilities, which are listed in **Table 8-3**, have been issued NPDES Stormwater permits (Note: The airport's permit is a combined stormwater/wastewater individual permit).

**Table 8-3: Municipal Operations That Have Been Issued NPDES Stormwater Permits**

Municipal Operation	Permit Number	Certificate of Permit Coverage Number	Address
CATS Transit Maintenance Operations Center	NCG080000	NCG080029	901 N. Davidson Street
CATS Bus Maintenance Operations Facility	NCG080000	NCG080710	3145 S. Tryon Street
Heavy Truck Shop, Truck Wash & Street Sweeper Yard	NCG080000	NCG080822	829 Louise Avenue
Heavy Equipment Shop	NCG080000	NCG080840	4600 Sweden Road
Light Vehicle Maintenance Shop	NCG080000	NCG080879	1031 Atando Avenue
Charlotte-Douglas International Airport	NC0083887	Not applicable	5501 Josh Birmingham Parkway
Irwin Creek WWTP	NCG110000	NCG110008	4000 Westmont Drive
Mallard Creek WWTP	NCG110000	NCG110114	12400 Highway 29 North
McAlpine Creek WWTP	NCG110000	NCG110010	12701 Lancaster Hwy
McDowell Creek WWTP	NCG110000	NCG110011	4901 Neck Road
Sugar Creek WWTP	NCG110000	NCG110012	5301 Closeburn Road

Semi-annual inspections were conducted at each facility listed in **Table 8-3**. The same inspection items listed above in sub-section 8.4 were reviewed at these permitted facilities. Emphasis was placed on elimination of illicit discharges, good housekeeping improvements, and compliance with permit and SWPPP requirements, including inspections, monitoring and training. The SWPPPs were reviewed and updated annually as required. Environmental personnel at the Airport and five wastewater treatment plants were responsible for updating the SWPPPs at their facilities, while the City's Municipal Good Housekeeping Program Manager reviewed and updated SWPPPs for the other five facilities listed in Table 8.3.

#### 8.5 Municipal Spill Response Procedures

Numerous activities conducted by City employees, both in the field and at facilities, have the potential to generate spills that may enter the City's MS4 and contaminate surface waters. Because of that risk, Spill Prevention and Response Procedures have been developed for all facilities (and associated field operations) listed in **Table 8-2**. To make the effort as seamless as possible, Spill Prevention and Response Procedures were incorporated into SWPPPs. The procedures and proper implementation of them was evaluated as part of the annual inspections.



Items that have been evaluated and incorporated into Spill Prevention and Response Plans include the following:

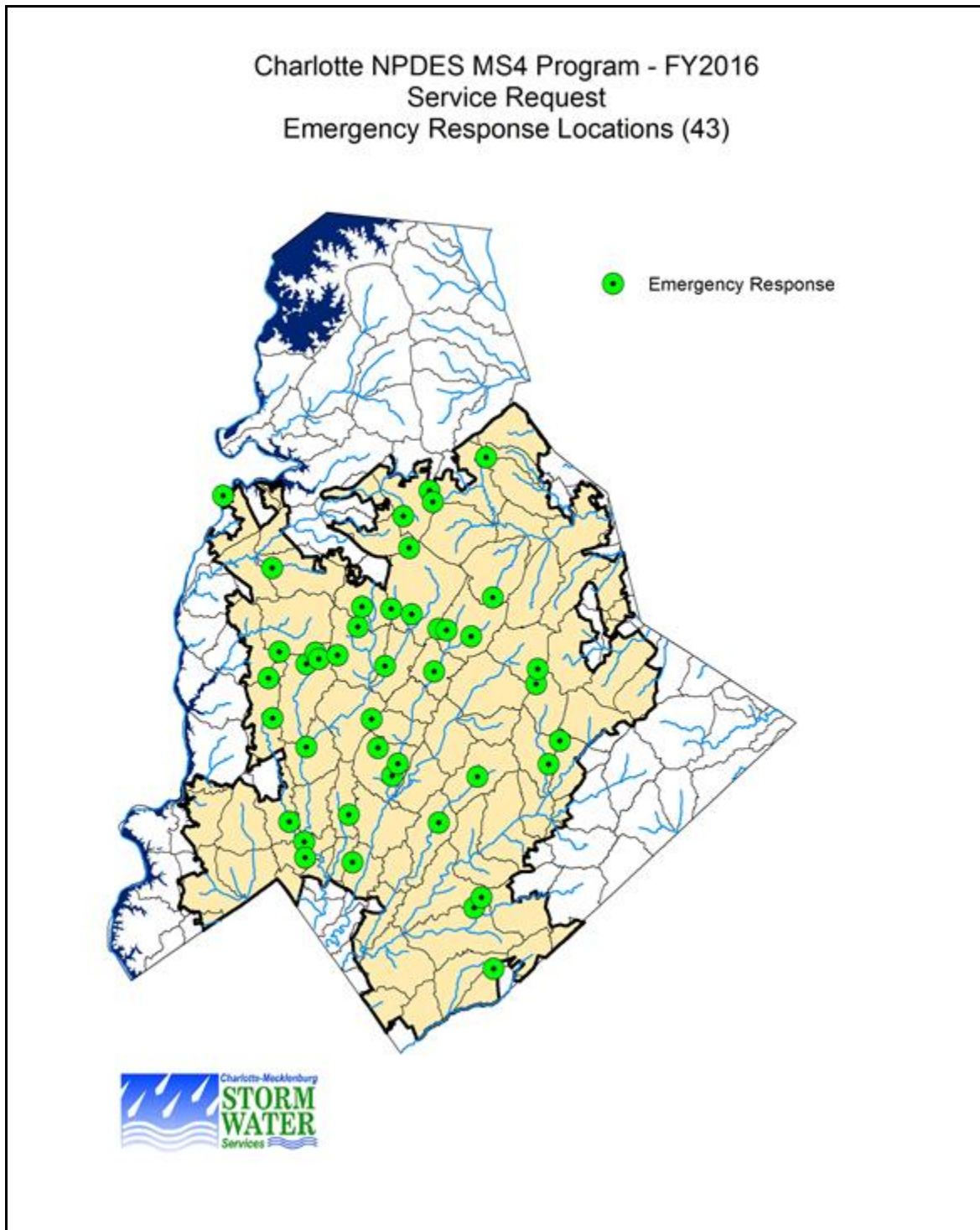
- Product storage tanks/containers, exposure, and secondary containment
- Flow path and potential for entry into the MS4
- Spill history, response to those spills, and documentation
- Activities that may generate spills
- Operating procedures to prevent spills
- Spill response procedures
- Spill response equipment and other countermeasures
- Employee training

As part of the Illicit Discharge Detection and Elimination program for the City, a 24-hour emergency response team is available to respond to environmental emergencies, including spills. The team responded to 43 hazardous materials releases during FY2016. **Figure 8-2** shows the locations of those releases. Members of the team act in an advisory role to the Charlotte Fire Department's Hazmat Team. Once Hazmat secures a scene and contains the spill, ER Team members work with the responsible party to ensure that spills were cleaned up properly and have minimal impacts to the environment. The team's actions were guided by a set of written Emergency Response Protocols.

#### 8.6 Vehicle and Equipment Cleaning Operations

The City recognizes the negative impacts that vehicle and equipment wash water runoff can have on stormwater and, ultimately, surface waters. Municipal employees washed the majority of vehicles and equipment at commercial or municipal vehicle wash facilities that drain to the sanitary sewer. Vehicle and equipment washing at municipal facilities continued to be assessed during annual inspections at all facilities listed in **Table 8-2**.

**FIGURE 8-2**



## 8.7 Streets, Roads, and Public Parking Lots Maintenance

Streets and parking lots can be a significant source of stormwater pollution. In previous years, the City has implemented various BMPs to address these pollutants within the MS4 by cleaning catch basins and other MS4 maintenance activities. As required by the current NPDES MS4 permit, during FY2016 the City implemented various BMPs that, in the City's opinion, would best address polluted stormwater runoff from municipally-owned streets and public parking lots prior to these pollutants entering the MS4. The following BMPs were those implemented during FY2016:

- Street Sweeping Program
- Adopt-A-Street Program
- Leaf and Yard Waste Collection Program
- Trash Receptacles along Downtown Streets
- Trash Receptacles and Litter Control activities at Park and Ride Parking Lots
- Public Education to address polluted stormwater runoff from municipally-owned streets and public parking lots

During FY2016, EPM-SWS staff began a study that will run through part of FY2017 to determine the effectiveness of lot sweeping by street/lot sweeping equipment. Four municipal lots with varied uses were selected for the study and a private contractor was selected to conduct the work. Two heavy-use lots were swept twice per month and two lighter-use lots were swept once per month. Samples were weighed and analyzed by UNC Charlotte faculty and staff. Results will be analyzed to determine the cost effectiveness of using vehicle sweepers to clean municipal lots in the future.

## 8.8 Municipal Structural BMPs and MS4 System Operation and Maintenance

In previous years, the City inventoried municipal structural BMPs and developed a list of over 120 BMPs to be inspected at various frequencies based on the type of BMP. The list continues to be updated as new structural BMPs are constructed. Routine maintenance activities include mowing, woody growth removal, cattail removal, inlet and outlet clearing, and other activities. Inspection and maintenance activities have been conducted to ensure proper function of structural BMPs. During FY2016, Standard Operating Procedures (SOP) were updated for the program, and a meeting was held with all involved staff to review the SOP. The City's Landscape Management Division and Building Services Division have primary responsibility for conducting inspections and ensuring proper maintenance. Employees at certain facilities where BMPs are located also assist with routine maintenance, such as grass mowing. Standard inspection forms have been developed and were utilized to conduct and document inspections. Completed inspection forms were provided to two BMP Inspection and Maintenance Coordinators, who then entered the information into the Cityworks database. They also worked with staff responsible for inspections to ensure they were completed as required.

The City conducted extensive cleaning and maintenance of the MS4 system during FY2016. Work included, but was not limited to, catch basin cleaning (manual and vacuum trucks), storm drain top cleaning, curb and gutter cleaning, culvert/channel cleaning, drainage structure

installation and repair, ditch reshaping, and erosion control. During FY2016, a total of 100,812 catch basin tops were manually cleaned; 2,632 catch basins were vacuumed out; 8,624 catch basin tops were vacuumed; and 49,950 linear feet of stormwater pipes were vacuumed out. All of this work was conducted according to written Standard Operating Procedures for each of these activities. Crews also addressed 2,576 citizen service requests throughout the year. All work information was recorded and entered into a database.

#### 8.9 Employee/Staff Training at Municipal Facilities

Seventeen (17) on-site training sessions were provided by CMSWS personnel at 13 of the municipal facilities listed on Table 8-2, while eight facilities elected to train their own staff (CATS Tryon, CATS Davidson, 5 wastewater facilities, airport). Another 152 employees from nine facilities were assigned an online training module. Of those who were assigned the module, 120 employees completed it, which is 79%. CMSWS staff will work with facility management to improve the completion percentage in future years. Some of the topics included in the training were:

1. Description of common pollutants, their sources and water quality impacts.
2. Description of the actions that each facility should take to reduce discharges of pollutants, with an emphasis on good housekeeping.
3. Description of effective spill prevention measures that should be employed at each facility.
4. Discussion of typical pollution sources at municipal operations and specific actions that should be taken to eliminate these sources and protect water quality.
5. Review of the Stormwater Pollution Prevention Plan where applicable.
6. Explanation of the potential negative consequences of failing to control pollutants at facilities.
7. Overview of IDDE Program and how to report observed water quality problems.

More details about the classroom and online training for municipal facilities is described in Section 5.5 as it is combined with education for employees related to the identification and reporting of illicit discharges.

#### 8.10 Measurable Goals/Planned Activities for Future Program Years

**Table 8-4** describes the various Municipal Pollution Prevention/Good Housekeeping Program BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.

**Table 8-4: BMP Measurable Goals for the Pollution Prevention/Good Housekeeping Program.**

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Operation and maintenance program for municipal facilities and operations.	Maintain and implement an operation and maintenance program for municipal facilities owned and operated by the permittee that have been determined by the permittee to have significant potential for generating polluted stormwater runoff that has the ultimate goal of preventing or reducing pollutant runoff.	Review and update Operation and Maintenance programs as necessary. Continue operation and maintenance activities per established procedures.	Review and update Operation and Maintenance programs as necessary. Continue operation and maintenance activities per established procedures.	Review and update Operation and Maintenance programs as necessary. Continue operation and maintenance activities per established procedures.	Review and update Operation and Maintenance programs as necessary. Continue operation and maintenance activities per established procedures.	Review and update Operation and Maintenance programs as necessary. Continue operation and maintenance activities per established procedures.
Site Pollution Prevention Plans for municipal facilities and operations.	Maintain and implement Site Pollution Prevention Plans for municipal facilities owned and operated by the permittee that have been determined by the permittee to have significant potential for generating polluted stormwater runoff that has the ultimate goal of preventing or reducing pollutant runoff.	Review and update facility SWPPPs as necessary. Continue implementation of SWPPPs.	Review and update facility SWPPPs as necessary. Continue implementation of SWPPPs.	Review and update facility SWPPPs as necessary. Continue implementation of SWPPPs.	Review and update facility SWPPPs as necessary. Continue implementation of SWPPPs.	Review and update facility SWPPPs as necessary. Continue implementation of SWPPPs.
Inspection and evaluation of municipal facilities and operations.	Maintain an inventory of municipal facilities and operations owned and operated by the permittee that have been determined by the permittee to have significant potential for generating polluted stormwater runoff, including the MS4 system and associated structural BMPs, conduct inspections at facilities and operations owned and operated by the permittee for potential sources of polluted runoff, the stormwater controls, and conveyance systems, and evaluate the sources, document deficiencies, plan corrective actions, implement	Review and update inventory of facilities for inspection. Conduct inspections of applicable facilities and make corrective actions where necessary.	Review and update inventory of facilities for inspection. Conduct inspections of applicable facilities and make corrective actions where necessary.	Review and update inventory of facilities for inspection. Conduct inspections of applicable facilities and make corrective actions where necessary.	Review and update inventory of facilities for inspection. Conduct inspections of applicable facilities and make corrective actions where necessary.	Review and update inventory of facilities for inspection. Conduct inspections of applicable facilities and make corrective actions where necessary.



	appropriate controls, and document the accomplishment of corrective actions.					
Spill Response Procedures municipal facilities and operations.	Maintain spill response procedures for municipal facilities and operations owned and operated by the permittee that have been determined by the permittee to have significant potential for generating polluted stormwater runoff.	Review facility spill response procedures and update as necessary. Continue implementation of procedures.	Review facility spill response procedures and update as necessary. Continue implementation of procedures.	Review facility spill response procedures and update as necessary. Continue implementation of procedures.	Review facility spill response procedures and update as necessary. Continue implementation of procedures.	Review facility spill response procedures and update as necessary. Continue implementation of procedures.
Prevent or Minimize Contamination of Stormwater Runoff from all areas used for Vehicle and Equipment Cleaning	Describe measures that prevent or minimize contamination of the stormwater runoff from all areas used for vehicle and equipment cleaning, including fire stations that serve more than three fire trucks and ambulances. Perform all cleaning operations indoors, cover the cleaning operations, ensure wash water drains to the sanitary sewer system, collect stormwater runoff from the cleaning area and providing treatment or recycling, or other equivalent measures. If sanitary sewer is not available to the facility and cleaning operations take place outdoors, the cleaning operations shall take place on grassed or graveled areas to prevent point source discharges of the wash water into the storm drains or surface waters.	Review procedures for vehicle and equipment cleaning operations and update as necessary. Ensure that corrective actions are implemented where operations are found to not be in compliance with the permit.	Review procedures for vehicle and equipment cleaning operations and update as necessary. Ensure that corrective actions are implemented where operations are found to not be in compliance with the permit.	Review procedures for vehicle and equipment cleaning operations and update as necessary. Ensure that corrective actions are implemented where operations are found to not be in compliance with the permit.	Review procedures for vehicle and equipment cleaning operations and update as necessary. Ensure that corrective actions are implemented where operations are found to not be in compliance with the permit.	Review procedures for vehicle and equipment cleaning operations and update as necessary. Ensure that corrective actions are implemented where operations are found to not be in compliance with the permit.





	<p>Where cleaning operations cannot be performed as described above and when operations are performed in the vicinity of a storm drainage collection system, the drain is to be covered with a portable drain cover during cleaning activities. Any excess standing water shall be removed and properly handled prior to removing the drain cover.</p> <p>Facilities that serve three or fewer fire trucks and ambulances and that cannot comply with these requirements shall incorporate structural measures during facility renovation.</p>					
Streets, roads, and public parking lots maintenance	The permittee shall evaluate BMPs to reduce polluted stormwater runoff from municipally-owned streets, roads, and public parking lots within the corporate limits. Within 12 months of permit issuance, the permittee must update its Stormwater Plan to include the BMPs selected.	Evaluate various types of BMPs that would best address polluted stormwater runoff from municipally-owned streets and parking lots and select BMPs based on the evaluation by Feb 28, 2014.	None	None	None	None
Streets, roads, and public parking lots maintenance	Within 24 months of permit issuance, the permittee must implement BMPs selected to reduce polluted stormwater runoff from municipally-owned streets, roads, and public parking lots identified by the permittee in the Stormwater Plan.	None	Implement BMPs selected from year one evaluation by Feb 28, 2015.	Continue to implement selected BMPs.	Continue to implement selected BMPs.	Continue to implement selected BMPs.
Operation and	Within 12 months of permit issuance,	Continue to	Continue to	Continue to	Continue to	Continue to

Maintenance (O&M) for municipally-owned or maintained structural stormwater BMPs and the storm sewer system (including catch basins, the conveyance system, and structural stormwater controls).	the permittee shall develop and implement an operation and maintenance program for structural stormwater BMPs and the storm sewer system (including catch basins, the conveyance system, and structural stormwater controls).	implement structural BMP operation, maintenance, and inspection program. Continue operation and maintenance program for the MS4 system.	implement structural BMP operation, maintenance, and inspection program. Continue operation and maintenance program for the MS4 system.	implement structural BMP operation, maintenance, and inspection program. Continue operation and maintenance program for the MS4 system.	implement structural BMP operation, maintenance, and inspection program. Continue operation and maintenance program for the MS4 system.	implement structural BMP operation, maintenance, and inspection program. Continue operation and maintenance program for the MS4 system.
Staff training	Maintain and implement a training plan that indicates when, how often, who is required to be trained and what they are to be trained on.	For facilities included in the municipal facility inspection program, conduct staff training on SWPPPs and Spill Response Procedures according to the Training Plan.	For facilities included in the municipal facility inspection program, conduct staff training on SWPPPs and Spill Response Procedures according to the Training Plan.	For facilities included in the municipal facility inspection program, conduct staff training on SWPPPs and Spill Response Procedures according to the Training Plan.	For facilities included in the municipal facility inspection program, conduct staff training on SWPPPs and Spill Response Procedures according to the Training Plan.	For facilities included in the municipal facility inspection program, conduct staff training on SWPPPs and Spill Response Procedures according to the Training Plan.

## 8.11 Program Assessment

The overall Pollution Prevention and Good Housekeeping Program was successfully implemented during the annual report period. The following **Table 8-5** shows a summary of the various items and corresponding data results for activities conducted under the program:

**Table 8-5: Program Summary**

<b>MUNICIPAL GOOD HOUSEKEEPING PROGRAM</b>	<b>FY2013</b>	<b>FY2014</b>	<b>FY2015</b>	<b>FY2016</b>	<b>FY2017</b>	<b>FY2018</b>
Number of City owned parcels inventoried	90	75	130	56		
Number of City facilities inspected <sup>(1)</sup>	31	31	31	50		
Number of municipal program evaluations	10	9	9	2		
Number of problems detected/corrected at City facility inspections	45	55	56	43		
Number of training sessions held	32	34	32	32		
Number of municipal facility employees trained	925	891	1118	760		

(1) Not all parcels are included in the municipal inspection program. See Sec 8.4

The following is clarification of numbers provided in Table 8-5:

- Number of city owned parcels inventoried includes properties purchased in the previous calendar year (in this case, 2015).
- Number of city facilities inspected includes those at which CMSWS staff conducted inspections (during FY2016 it included roughly half of the fire stations, which are inspected once every 5 years).
- Municipal program evaluations include reviews (field observations, meetings, etc.) of municipal field operations for development and/or implementation of stormwater pollution prevention best practices.
- Includes problems found during city facility inspections (doesn't include very small issues).
- Number of training sessions held includes classroom sessions (including those conducted under the work plan and by wastewater treatment and airport facilities) and number of facilities assigned the online training module.
- Employees trained includes all employees who completed training in the sessions described in the bulleted item above.

The City of Charlotte has a very comprehensive Municipal Good Housekeeping and Pollution Prevention program. Program depth and scope has expanded each year. With the frequency of inspections and training, City staff have grown in awareness and knowledge of stormwater pollution prevention issues. However, with the large growth in the City of Charlotte, there is still plenty of need for process improvement. Specific focus areas will include:

- Continuing to develop and improve upon stormwater pollution prevention best practices among city field operations.
- Municipal street and lot sweeping, with a specific focus on water quality improvement.

- Comprehensive improvement in the spills program including training, written procedures, cleaning, reporting, recording, and other elements.
- Contractor training and expectations.
- Continuous improvement in inspection and maintenance of city-owned structural BMPs.
- Increased communication and work with other departments and committees to integrate more stormwater pollution prevention, green infrastructure, and other stormwater measures into city projects and infrastructure.

## **Section 9: Industrial Facilities Evaluation and Monitoring Program**

During the annual report period, inspection and monitoring activities were conducted under the Industrial Facilities Inspection and Monitoring Program per the SWMP. The following subsections explain activities completed under this program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

### **9.1 BMP Summary Table**

**Table 9-1** provides information concerning the BMPs that are implemented every year to fulfill NPDES requirements for Industrial Facilities.

**Table 9-1: BMP Summary Table for the Industrial Facilities Program.**

<b>BMP</b>	<b>BMP Description</b>	<b>Responsible Position</b>
Maintain an Inventory of Industrial Facilities	Maintain an inventory of permitted hazardous waste treatment, disposal, and recovery facilities, industrial facilities that are subject to Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), industrial facilities identified with an industrial activity permitted to discharge stormwater to the permittee's MS4, or as identified as an illicit discharge under the IDDE Program.  For the purposes of this permit, industrial activities shall mean all permitted industrial activities as defined in 40 CFR 122.26.	Water Quality Program Manager
Inspection Program	Identify priorities and inspection procedures. At a minimum, priority facilities include those identified above in subsection II.H.2.a.	
Evaluate Industrial Facilities discharging stormwater to the City's MS4	The Permittee is required to evaluate control measures implemented at permitted hazardous waste treatment, disposal, and recovery facilities, industrial facilities that are subject to Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), industrial facilities identified with an industrial activity permitted to discharge stormwater to the permittee's MS4, or as identified as an illicit discharge under the IDDE Program.  For permitted facilities, the municipality shall establish procedures for reporting deficiencies and non-compliance to the permitting agency. Where compliance with an existing industrial stormwater permit does	

	<p>not result in adequate control of pollutants to the MS4, municipality will recommend and document the need for permit modifications or additions to the permit issuing authority.</p> <p>For the purposes of this permit, industrial activities shall mean all permitted industrial activities as defined in 40 CFR 122.26. For the purpose of this permit, the Permittee is authorized to inspect the permitted hazardous waste treatment, disposal, and recovery facilities as an authorized representative of the Director.</p>	
--	---	--

## 9.2 Industrial Facility Inventory

The City continues to maintain a large Industrial Facilities Inventory including those in one or more of the following categories:

- hazardous waste TSD facility,
- SARA Title III facility (TRI reporter),
- NPDES stormwater permitted facility,
- Stormwater No Exposure Certificate facility,
- Industrial Wastewater Pre-Treatment permitted facility, and
- facilities identified as having an illicit discharge under the IDDE Program.

The inventory continues to grow, and includes facilities that discharge to the City's MS4 and have the potential to discharge significant pollutant loads. This inventory is used to select each year's facilities for inspection and monitoring.

The goal is to inspect all NPDES permitted facilities every five (5) years, with more frequent inspections conducted at facilities with previous compliance issues or facilities that are deemed to have a higher potential to pollute. Non-permitted industrial facilities are selected for inspection based on the recommendation of CMSWS staff members, citizen complaints, or from viewing aerial photography that indicated potential pollution issues on site.

Vehicle maintenance facilities are also inspected as part of this program because they are a known source of poor housekeeping and illicit discharges. Facilities are selected for inspection based on a combination of targeting priority watershed basins, aerial photography suggesting potential to pollute, and staff recommendations. For FY2016, the watersheds prioritized for inspection were Reedy Creek, Briar Creek, Upper Little Sugar Creek, and Upper Irwin Creek.

## 9.3 Industrial Facilities Inspection and Monitoring Program

The purpose of the Industrial Facilities Inspection and Monitoring Program is to evaluate activities at industrial facilities that may impact stormwater discharges, and then work with problem facilities to reduce identified stormwater pollution. The following provides a general description of the tasks conducted as part of this program:

- Assessment of facility operations and maintenance activities
- Evaluation of waste disposal and storage methods

- Evaluation of the stormwater drainage system, including catch basin inlets, structural best management practices and outfalls
- Review of spill response and clean up procedures
- Evaluation of housekeeping practices with recommended revisions as necessary to eliminate potential pollution sources
- Evaluation of outdoor storage facilities and recommendations for elimination of potential pollution sources
- Identification and elimination of dry weather discharges
- Review of Stormwater Pollution Prevention Plan implementation where applicable, including effluent monitoring (if required by permit)
- Sample/monitor stormwater runoff and/or dry weather flows. Evaluate data results.
- Completion of a written report documenting findings and recommendations

A standard inspection form is used when conducting all inspections. There is separate inspection form for Vehicle Maintenance Facility inspections (previously the Used Oil Facility inspection program). During FY2016, this template inspection form for vehicle maintenance facilities was updated from the previous program to include additional housekeeping and outfall evaluation criteria. For inspections at NPDES permitted facilities, any deficiencies related to NPDES stormwater permit requirements were identified and included in the report, with a copy going to the NC Department of Environmental Quality (NCDEQ). The understanding between the City and NCDEQ is that the State is responsible for following-up on permit-related deficiencies and violations since they are the issuing regulatory authority for the permits. Facilities that were found without coverage under an appropriate general stormwater permit category were also brought to the attention of NCDEQ personnel.

To provide consistent inspections and quality assurance, CMSWS maintains an Industrial Facilities Inspection and Monitoring Procedures Manual and conducts training each year for staff that participates in the program. The manual provides a description of all program components including instructions, guidance forms, and templates for conducting inspections and monitoring, collecting vital information, writing reports and conducting follow-up activities. During FY2016, the manual was reviewed and updated by CMSWS staff and five inspection staff members were trained.

During FY2016 the Industrial Facilities Inspection and Monitoring Program inspected 40 industrial facilities (33 permitted and 7 non-permitted) and 15 vehicle maintenance shops. **Tables 9-2 and 9-3** provide a list of the facilities inspected while **Figures 9-1 and 9-2** show the location of these facilities.

**Table 9-2: FY2016 List of Industrial Facility Inspections**

Facility	NPDES Permit #	Address
Wire-Bond	NCG030629	400 Roundtree Rd
Ward Tank	NCG030591	6670 E WT Harris Blvd
CoaLogix SCR-Tech	NCG030617	11707 Steele Creek Rd
Atlas Copco - Nations Ford Office	NCG030621	200 Forsyth Hall Dr
City Salvage Incorporated	NCG100082	3628 Northerly Road



Harper Corporation of America	NCG030630	11625 Steele Creek Rd
Pull-a-Part of Charlotte	NCG100173	6024 North Tryon Street
Adams - Charlotte/Reames Road (Oldcastle Precast)	NCG070203	9950 Metromont Industrial Blvd
Prestress of the Carolinas	NCG070205	11630 Texland Blvd
D. H. Griffin Wrecking Co.	NCG070183	11205 Reames Rd
Metromont Corporation	NCG070028	4101 Greensboro St
Larry Campbell's Towing & Recovery Inc	NCG080584	7327 Old Statesville Rd
RK Hydro-Vac	NCG130072	3115 Sears Road
Charlotte GP Transflo Terminal	NCG080664	601 N Hoskins Rd
Knight Transportation	NCG080877	7001 Statesville Rd
Charlotte Intermodal Facility	NCG080922	5710 West Blvd
Renner USA Corporation	NCG090029	651 Michael Wylie Dr
Hunter Auto & Wrecker Service	NCG100075	1114 N Davidson St
Salvage Auto Supply LLC	NCG100207	3301 Robinson Cir
Caraustar Recovered Fiber Group Inc.	NCG130062	2426 Chamberlain Ave
Mecklenburg (Southern Concrete Materials)	NCG140164	715 State St
South Plant (Concrete Supply)	NCG140043	400 Minuet Ln
Mallard Creek Polymers	NCG090006	2800 Morehead Road
Arrowood Plant (Concrete Supply)	NCG140246	12148 Nations Ford Rd
IFCO	NCG210432	5808 Long Creek Park
Concrete Supply Co-Reames Road	NCG140312	9950 Metromont Industrial Blvd
Blythe Construction, Inc. - N. Plant	NCG160034	11333 Reames Rd
LANE (Arrowood)	NCG160081	12609 Nations Ford Rd
Rea Contracting (Mallard Creek)	NCG160088	575 Mallard Creek Church
Queen City Metal Recycling and Salvage	NCG200458	2800 N Tryon St
Atlantic Scrap & Processing LLC (OmniSource)	NCG200351	419 Atando Ave
IGM Resins Charlotte, Inc.	NCS000049	3300 Westinghouse Blvd
Refabco	NCG030385	200 east 27th street
<b>Non permitted:</b>		
Novem Industries	n/a	3901 N Graham Street
Trash / Recycling process site		2214 N Graham Street
L and L Environmental Services		3304 Robinson Circle
Blythe Brothers Asphalt		10000 Old Nations Ford Road
Metromont Natural Recycling		10050 Metromont Industrial Blvd
Sam Auto Salvage		2711 Wilkinson Blvd
R & R Fleet Service		200 Atando Ave

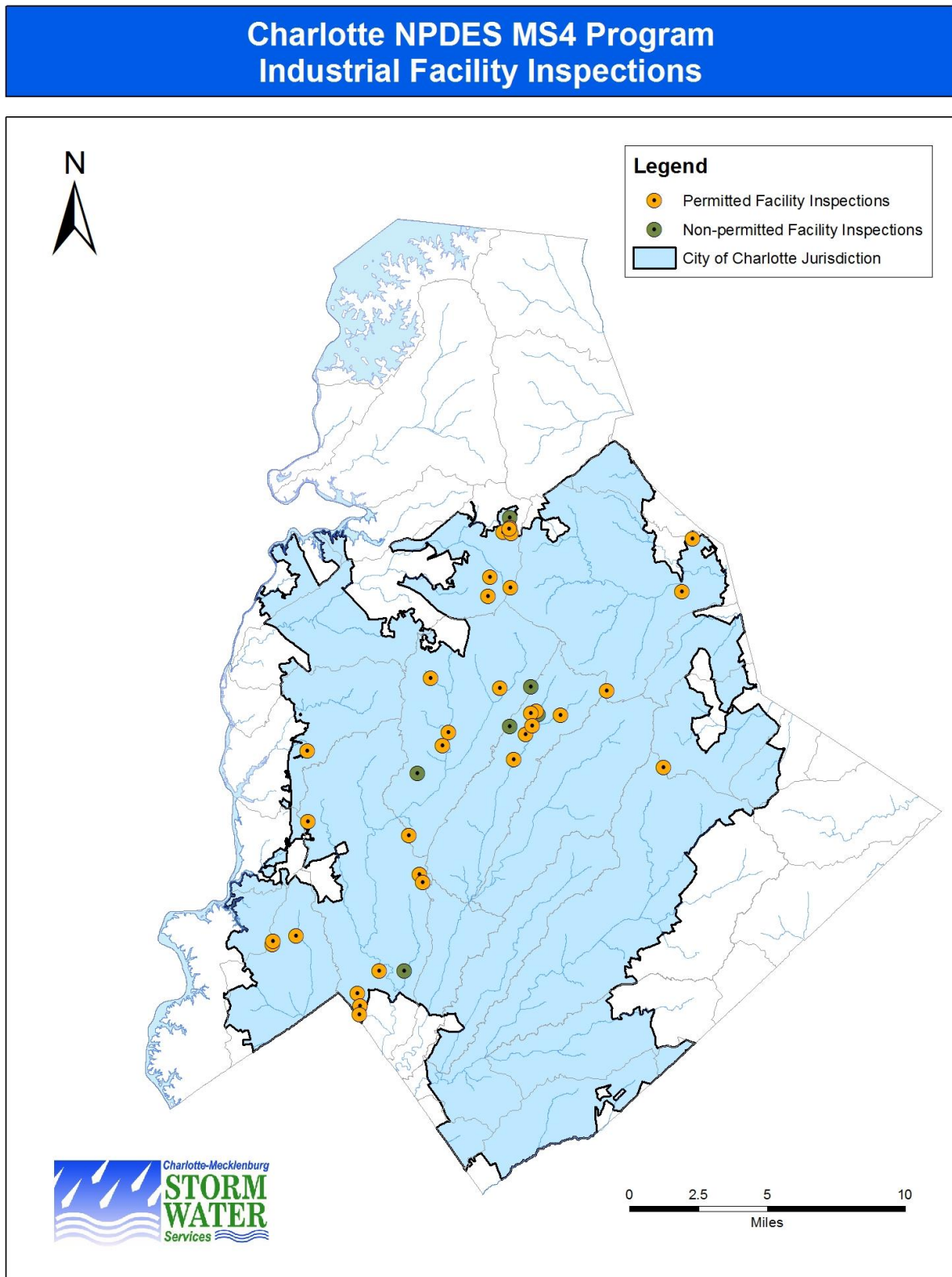
**Table 9-3: FY2016 List of Vehicle Maintenance Facility Inspections**

Facility	Address
Express Auto Tune	7001 E. WT Harris Blvd
POZ Auto	6909 E. WT Harris Blvd
Jiffy Lube	7024 E. WT Harris Blvd
International Auto Care	4732 Central Ave
Swami Complete Auto Care	4632 Central Ave
A&J Auto Center	3600 North Sharon Amity
Elvis Auto Repair	5137 Central Ave
Porky's Auto Repair	5123 Central Ave
JLB Auto Repair	542 West Sugar Creek Road
Cartech Auto	1434 Craighead Road
Motor Casting Repair	4226 North Graham Street

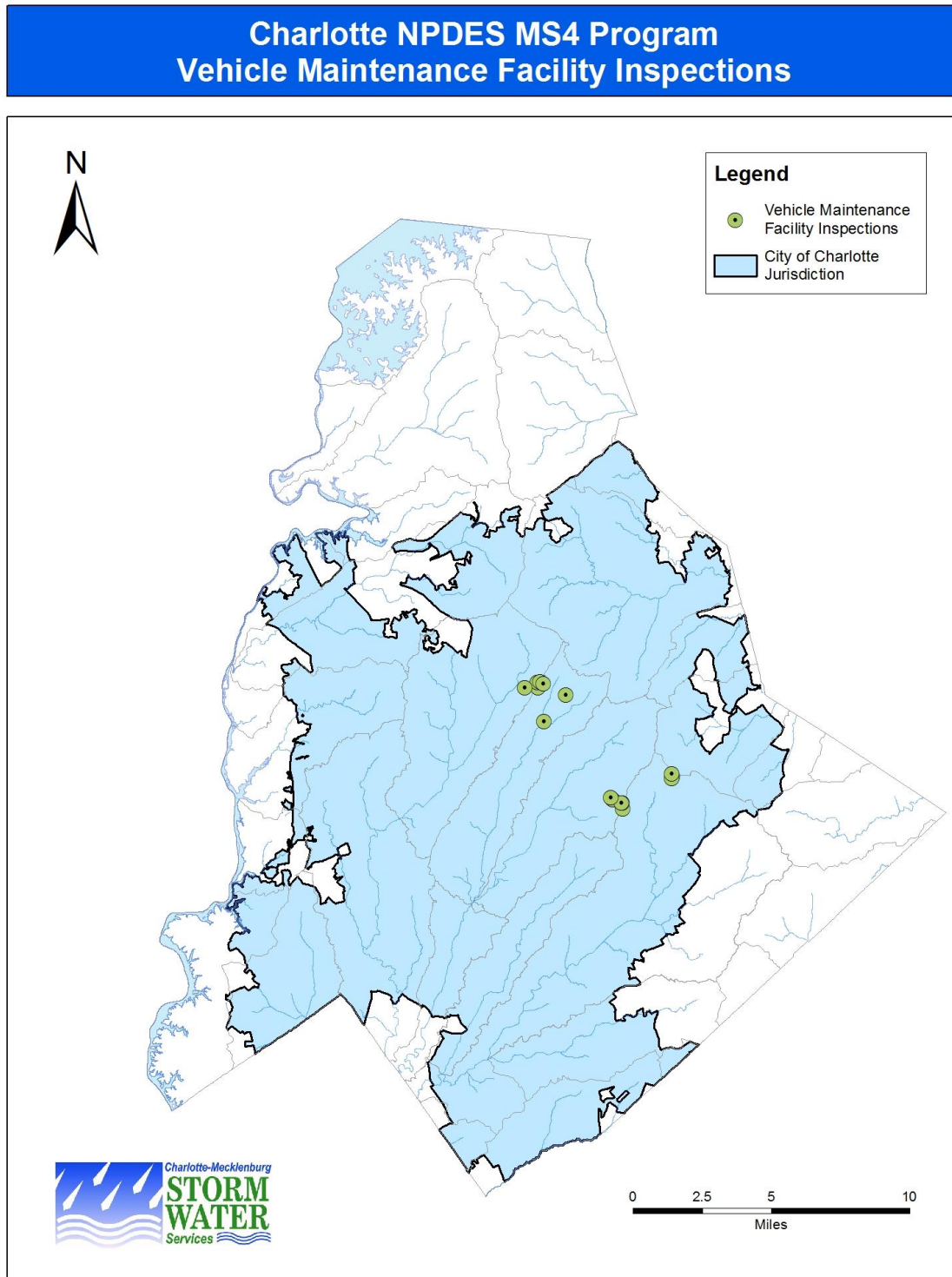


Superior Truck Service	1415 Metals Drive
Jim's Auto Repair	110 East 36 <sup>th</sup> Street
Galindo Auto Repair	3730 Hartley Street
Diesel Doctors	4200 Joe Street

**FIGURE 9-1**



**FIGURE 9-2**



#### 9.4 Evaluation Measures

As discussed in sub-section 9.3, the appropriate evaluation measures that were implemented to reduce polluted discharges to Charlotte's MS4 were industrial inspections and monitoring. Inspection letters noted that the inspection was being conducted to satisfy both State and City NPDES MS4 permit requirements. As pollution sources were identified through the inspection and monitoring program, the City worked with the State and facility personnel to eliminate the pollution sources. When violations of illicit discharge prohibitions and other applicable regulations were identified, enforcement measures were implemented, especially in cases where facility personnel did not show appropriate efforts in correcting violations.

#### 9.5 Measurable Goals/Planned Activities for Future Program Years

**Table 9-4** describes the various Industrial Facilities Program BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.

**Table 9-4:** BMP Measurable Goals for the Industrial Facilities Program.

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Maintain an Inventory of Industrial Facilities	Maintain an inventory of permitted hazardous waste treatment, disposal, and recovery facilities, industrial facilities that are subject to Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA), industrial facilities identified with an industrial activity permitted to discharge stormwater to the permittee's MS4, or as identified as an illicit discharge under the IDDE Program.  For the purposes of this permit, industrial activities shall mean all permitted industrial activities as defined in 40 CFR 122.26.	Maintain and update the industrial facility inventory as needed.	Maintain and update the industrial facility inventory as needed.	Maintain and update the industrial facility inventory as needed.	Maintain and update the industrial facility inventory as needed.	Maintain and update the industrial facility inventory as needed.
Inspection Program	Identify priorities and inspection procedures. At a minimum, priority facilities include those identified above in subsection II.H.2.a.	Update current Industrial Inspection and Monitoring Procedures and develop an inspection prioritization strategy	Update inspection and monitoring procedures and prioritization strategy as necessary.	Update inspection and monitoring procedures and prioritization strategy as necessary.	Update inspection and monitoring procedures and prioritization strategy as necessary.	Update inspection and monitoring procedures and prioritization strategy as necessary.
Evaluate Industrial Facilities discharging stormwater to the City's MS4	The Permittee is required to evaluate control measures implemented at permitted hazardous waste treatment, disposal, and recovery facilities, industrial facilities that are subject to Section 313 of Title III of the Superfund Amendments and	Conduct inspection and monitoring activities based on established procedures and prioritization strategy at 50	Conduct inspection and monitoring activities based on established procedures and prioritization strategy at 50	Conduct inspection and monitoring activities based on established procedures and prioritization strategy at 50	Conduct inspection and monitoring activities based on established procedures and prioritization strategy at 50	Conduct inspection and monitoring activities based on established procedures and prioritization strategy at 50





	<p>Reauthorization Act of 1986 (SARA), industrial facilities identified with an industrial activity permitted to discharge stormwater to the permittee’s MS4, or as identified as an illicit discharge under the IDDE Program.</p> <p>For permitted facilities, the municipality shall establish procedures for reporting deficiencies and non-compliance to the permitting agency. Where compliance with an existing industrial stormwater permit does not result in adequate control of pollutants to the MS4, municipality will recommend and document the need for permit modifications or additions to the permit issuing authority.</p> <p>For the purposes of this permit, industrial activities shall mean all permitted industrial activities as defined in 40 CFR 122.26. For the purpose of this permit, the Permittee is authorized to inspect the permitted hazardous waste treatment, disposal, and recovery facilities as an authorized representative of the Director.</p>	facilities per year.	facilities per year.	facilities per year.	facilities per year.	facilities per year.
--	--	----------------------	----------------------	----------------------	----------------------	----------------------

## 9.6 Program Assessment

The overall Industrial Facilities and Monitoring Program was successfully implemented during the annual report period. The following **Table 9-5** shows a summary of the various items and corresponding data results for activities conducted under the program:

**Table 9-5: Program Summary**

INDUSTRIAL SITE PROGRAM	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
Number of sites on master inspection inventory	358	384	468	342		
Number of industrial sites inspected	51	51	50	40		
Number of vehicle maintenance facilities inspected	15	20	21	15		
Number of sites monitored	10	10	10	8		
Industrial facility deficiencies with Notices issued	13	7	7	5		
Number of illicit discharges or connections discovered	3	0	0	3		

The following is clarification of certain numbers provided in Table 9-5:

- Includes industrial facilities with an NPDES Stormwater permit, Stormwater No Exposure Certificate, Charlotte Water pre-treatment permit and/or is a TRI submitter or TSD facility.
- Number of industrial facility deficiencies with Notices issued includes industrial facilities whose reports were issued as an NOV or Unsatisfactory with regard to their compliance with the City of Charlotte’s Stormwater Pollution Control Ordinance. Facilities with strictly NPDES permit compliance issues (e.g., lack of required monitoring or training) were not counted in this number.

Of the 40 industrial inspections conducted, three (3) illicit discharges were discovered, 2 of the permitted sites were unsatisfactory and 2 of the non-permitted sites were unsatisfactory. Five (5) of the non-permitted facilities were observed to likely be subject to an NPDES stormwater permit because of their SIC Code, exposure of outdoor materials, and the presence of at least one outfall onsite. CMSWS staff notified NCDEQ about those facilities. Of the 15 vehicle maintenance facilities, five deficiencies were identified.

All facilities where deficiencies were noted received follow-up correspondence and inspections from CMSWS staff to assist with compliance. As a result of communicating the results of these inspections with NCDEQ, two (2) facilities obtained a new stormwater permit and one facility received a Notice of Violation for operating without a permit.

Stormwater monitoring was conducted at eight (8) facilities (5 permitted and 3 non-permitted). No illicit discharges or illicit connections were observed during monitoring activities, but 87.5% of the facilities monitored exceeded the state standard for turbidity, zinc and fecal coliform.

Letters summarizing the analytical sampling results were sent to each monitored facility and copies were provided to NCDEQ for NPDES permitted facilities. For facilities with elevated pollutant levels, follow-up inspections were conducted and recommendations were made to improve outdoor operations, housekeeping, material storage practices, and other measures that should result in reduced pollutant runoff.

In 2011, a Standard Administrative Procedure (SAP) was developed for reviewing, interpreting and following up on monitoring data from the Industrial Inspections and Monitoring Program. The main purpose of the SAP is to make analysis of the monitoring data as objective as possible. As part of the SAP, summary statistics and tables were created from all past monitoring data at local industrial sites. Comparing individual monitoring results to the summarized data set allows staff to compare results at a particular facility with the entire data set.

## **Section 10: Water Quality Assessment and Monitoring Program**

During the annual report period, monitoring activities were conducted per the Water Quality Assessment and Monitoring program plan developed during FY2008 per the SWMP. The following sub-sections explain activities completed under this program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

### **10.1 BMP Summary Table**

**Table 10-1** provides information concerning the BMPs implemented to fulfill the requirements of the Water Quality Assessment and Monitoring Program. Funding for the BMPs in this section is covered by local stormwater utility fees.

**Table 10-1:** BMP Summary Table for the Water Quality Assessment and Monitoring Program.

BMP	BMP Description	Schedule (yrs)					Responsible Position
		1	2	3	4	5	
Water Quality Assessment and Monitoring Plan	Maintain a Water Quality Assessment and Monitoring Plan. The Plan shall include a schedule for implementing the proposed assessment and monitoring activities.	X	X	X	X	X	Water Quality Program Manager
Water Quality Monitoring	Maintain and implement the Water Quality Assessment and Monitoring Plan submitted to DWQ.	X	X	X	X	X	Water Quality Program Manager

### **10.2 Water Quality Assessment and Monitoring Plan**

The City has been conducting water quality monitoring of streams and stormwater discharges since the inception of its NPDES MS4 Permit Program in 1992. Initially, the monitoring program focused mainly on identifying illicit discharges and sewer overflows and included

sampling for fecal coliform bacteria. Data was used to identify and eliminate these illegal discharges to the MS4 and surface waters and proved to be highly successful. While current water quality monitoring efforts continue to be used for this purpose, the program has been expanded over the years to include a wider array of water quality parameters with the additional goal of identifying short-term and long-term water quality trends and gauging overall program effectiveness, where possible.

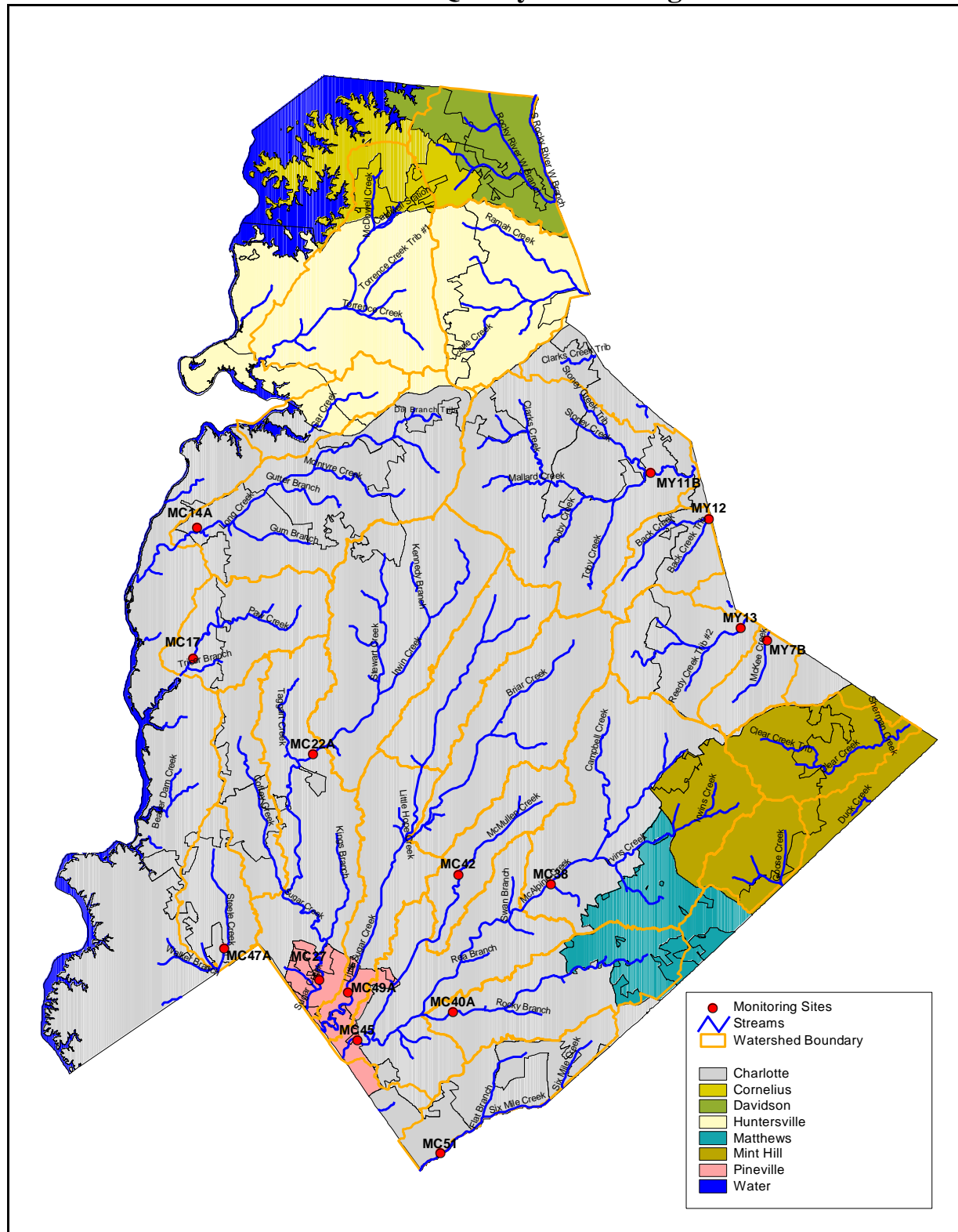
As part of the previous NPDES MS4 permit and SWMP, the City developed a Water Quality Assessment and Monitoring Plan during FY2008 that detailed the monitoring activities, parameters, and data assessment to be conducted as required by the permit. The plan specifies, at a minimum, water quality monitoring activities to be performed on a quarterly basis at a total of 15 stream sites in the major watersheds in the City. Monitoring per the plan was conducted for chemical and physical parameters on a fixed interval monitoring basis.

**Table 10-2** provides a list of the water quality parameters sampled at the monitoring sites. **Figure 10-1** shows a map of the Charlotte monitoring sites and **Table 10-3** contains a description and location of the 15 monitoring sites specified in the monitoring plan.

**Table 10-2: Water Quality Monitoring Parameters.**

Parameter	Sample Type	Frequency (Minimum)
Fecal Coliform	Grab	Quarterly
E-Coli	Grab	Quarterly
Total Phosphorus	Grab	Quarterly
Nitrite + Nitrate	Grab	Quarterly
Total Kjeldahl Nitrogen	Grab	Quarterly
Ammonia Nitrogen	Grab	Quarterly
Total Suspended Solids	Grab	Quarterly
Turbidity	Grab	Quarterly
Copper	Grab	Quarterly
Zinc	Grab	Quarterly
Chromium	Grab	Quarterly
Lead	Grab	Quarterly
Dissolved Oxygen	Grab	Quarterly
Temperature	Grab	Quarterly
Conductivity	Grab	Quarterly
pH	Grab	Quarterly

**FIGURE 10-1**  
**Charlotte Water Quality Monitoring Sites**



**Table 10-3:** Description of City of Charlotte Water Quality Monitoring Sites.

Site #	Stream	Location
MY11B	Mallard Creek	Pavilion Blvd Bridge, S. of US Hwy 29
MY12B	Back Creek	Stream location, off of Wentwater Street, near Caldwell Rd.
MY13	Reedy Creek	Reedy Creek Rd. Bridge, S. of Plaza Rd. Ext.
MY7B	McKee Creek	Reedy Creek Rd. Bridge, S. of Harrisburg Rd.
MC14A	Long Creek	Pine Island Dr. at End of Street at Golf Course
MC17	Paw Creek	Hwy 74 Culvert, Between Sam Wilson & Little Rock Rd.
MC22A	Irwin Creek	Westmont Dr. Bridge, at Irwin Creek WWTP
MC27	Sugar Creek	Hwy. 51 Bridge, E. of Downs Rd.
MC38	McAlpine Creek	Sardis Rd. Bridge, Between Sardis Ln. & Sardis Rd. N.
MC40A	Four Mile Creek	Elm Ln. Bridge, S. of Hwy. 51
MC42	McMullen Creek	Sharon View Rd. Bridge, Between Sharon Rd. & Colony Rd.
MC45	McAlpine Creek	McAlpine Creek WWTP
MC47A	Steele Creek	Carowinds Blvd. Culvert, W. of Carowinds Amusement Park
MC49A	Little Sugar Creek	Hwy. 51 Bridge, W. of Carolina Place Mall
MC51	Six Mile Creek	Marvin Rd. Bridge, S. of Ardrey Kell Rd.

### 10.3 Water Quality Monitoring Implementation

The City prepared and submitted its Water Quality Assessment and Monitoring Plan to NCDEQ-DEMLR (formerly NCDENR-DWQ) during FY2008 as described in sub-section 10-2 above. The previous NPDES MS4 permit specified that the plan was to be reviewed and approved by NCDEQ; however, to date the City has not ever received any comment or formal approval from NCDEQ-DEMLR concerning the plan. Nevertheless, the City had begun implementation of the plan during FY2009 and has continued this implementation annually through FY2016 to conduct quarterly fixed interval monitoring at the 15 monitoring sites specified in the plan. In addition to the minimum monitoring required in the plan, the City also conducts increased monitoring at additional sites to support other initiatives and management activities.

### 10.4 Water Quality Assessment and Monitoring Plan Revisions

The City has reviewed the monitoring plan and data generated for FY2016 and proposes no major changes to the plan at this time.

### 10.5 Measurable Goals/Planned Activities for Future Program Years

**Table 10-4** describes the various Water Quality Assessment and Monitoring Program BMPs and the Measurable Goals and Planned Activities for Future Program Years for each BMP by permit term year.



**Table 10-4:** BMP Measurable Goals for the Water Quality Assessment and Monitoring Program.

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Water Quality Assessment and Monitoring Plan	Maintain a Water Quality Assessment and Monitoring Plan. The Plan shall include a schedule for implementing the proposed assessment and monitoring activities.	Maintain the WQ Assessment & Monitoring Plan and update as necessary.	Maintain the WQ Assessment & Monitoring Plan and update as necessary.	Maintain the WQ Assessment & Monitoring Plan and update as necessary.	Maintain the WQ Assessment & Monitoring Plan and update as necessary.	Maintain the WQ Assessment & Monitoring Plan and update as necessary.
Water Quality Monitoring	Maintain and implement the Water Quality Assessment and Monitoring Plan submitted to DWQ.	Maintain and implement the monitoring plan and conduct WQ assessment and monitoring activities per the plan.	Maintain and implement the monitoring plan and conduct WQ assessment and monitoring activities per the plan.	Maintain and implement the monitoring plan and conduct WQ assessment and monitoring activities per the plan.	Maintain and implement the monitoring plan and conduct WQ assessment and monitoring activities per the plan.	Maintain and implement the monitoring plan and conduct WQ assessment and monitoring activities per the plan.

## 10.6 Program Assessment

The overall Water Quality Assessment and Monitoring Program was successfully implemented during the annual report period. The following **Table 10-5** shows a summary of the various items and corresponding data results for activities conducted under the program:

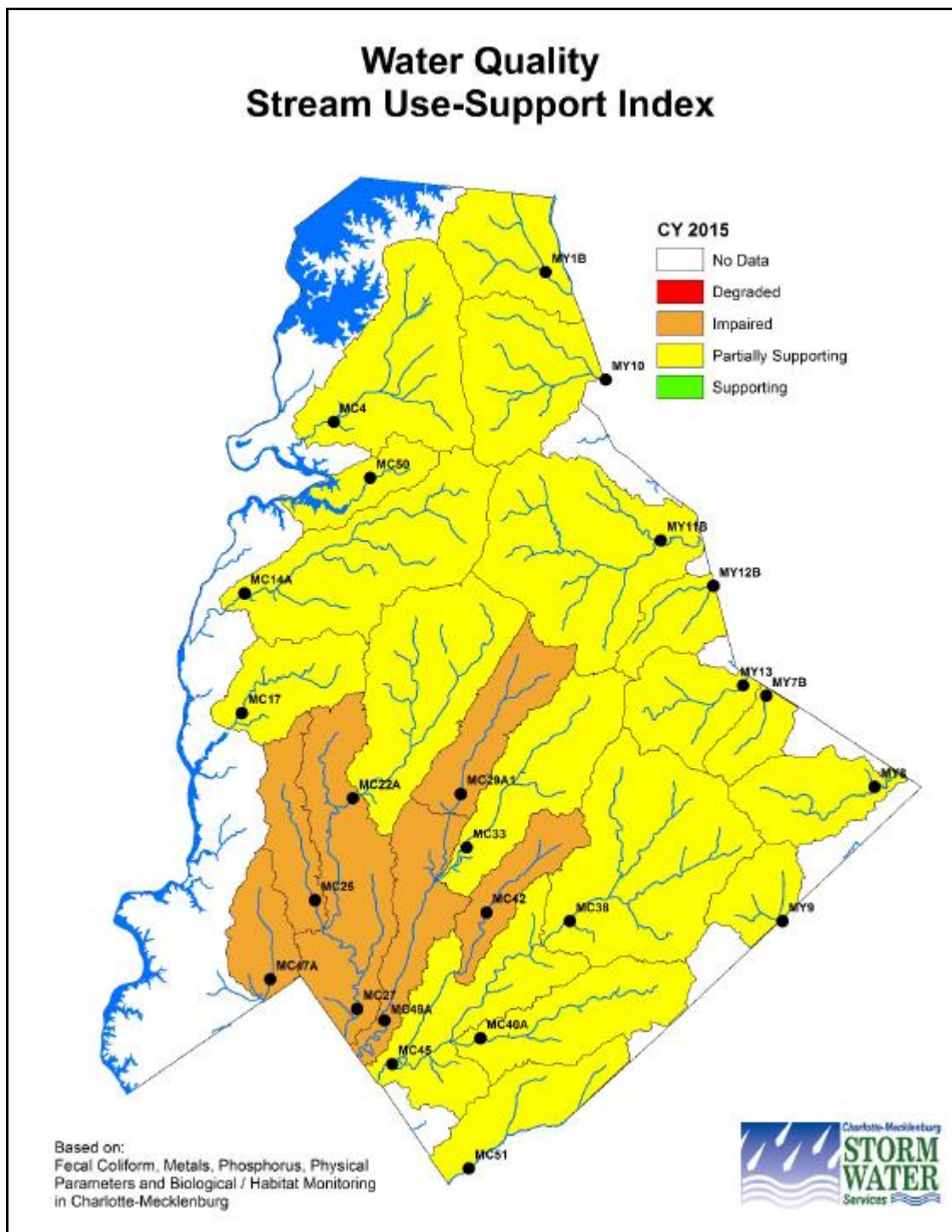
**Table 10-5:** Program Summary

<b>WATER QUALITY MONITORING PROGRAM</b>	<b>FY2013</b>	<b>FY2014</b>	<b>FY2015</b>	<b>FY2016</b>	<b>FY2017</b>	<b>FY2018</b>
Stream sites monitored (minimum quarterly per Plan)	15	15	15	15		
Stream samples collected (minimum total per plan)	60	60	60	60		
Laboratory sample analyses conducted	720	720	720	720		
Stream physical measurements (DO, Temp, pH, Cond)	240	240	240	240		
IDDE problems detected/corrected through monitoring	0	1	0	2		

### 10.6.1 Water Quality Trend Analysis

The City utilizes WQ data generated from various monitoring programs, including NPDES MS4, to generate a Stream Use Support Index. The index is mapped to visually represent WQ conditions by sub-basin and can be compared year by year to determine general trends. The index map for calendar year 2015 is shown below in **Figure 10-2**. The map shows general WQ conditions to be in the partially supporting to impaired category for the sub-basins within the City.

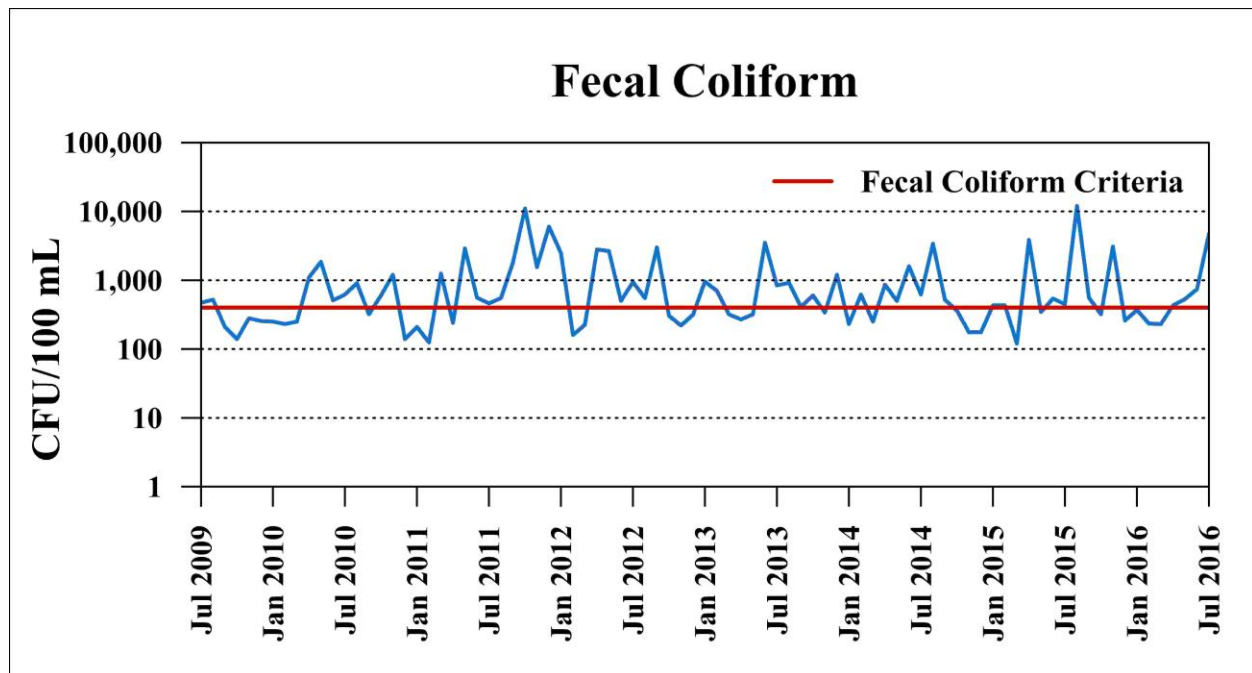
**FIGURE 10-2**

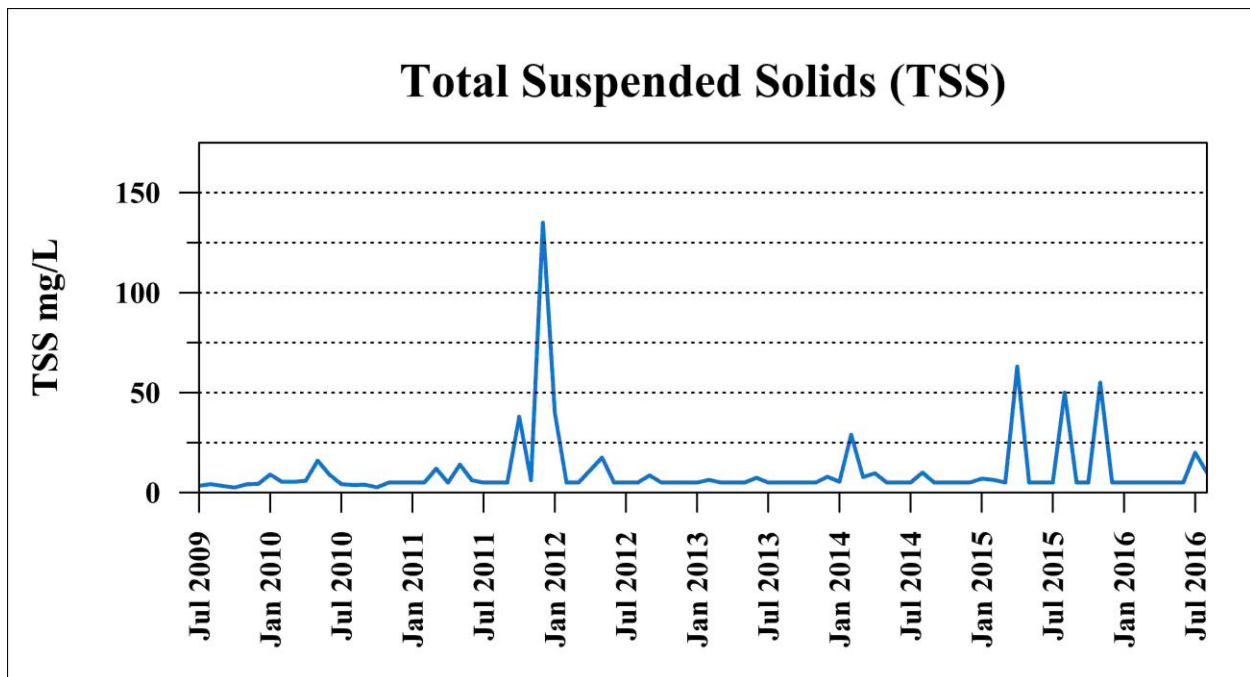
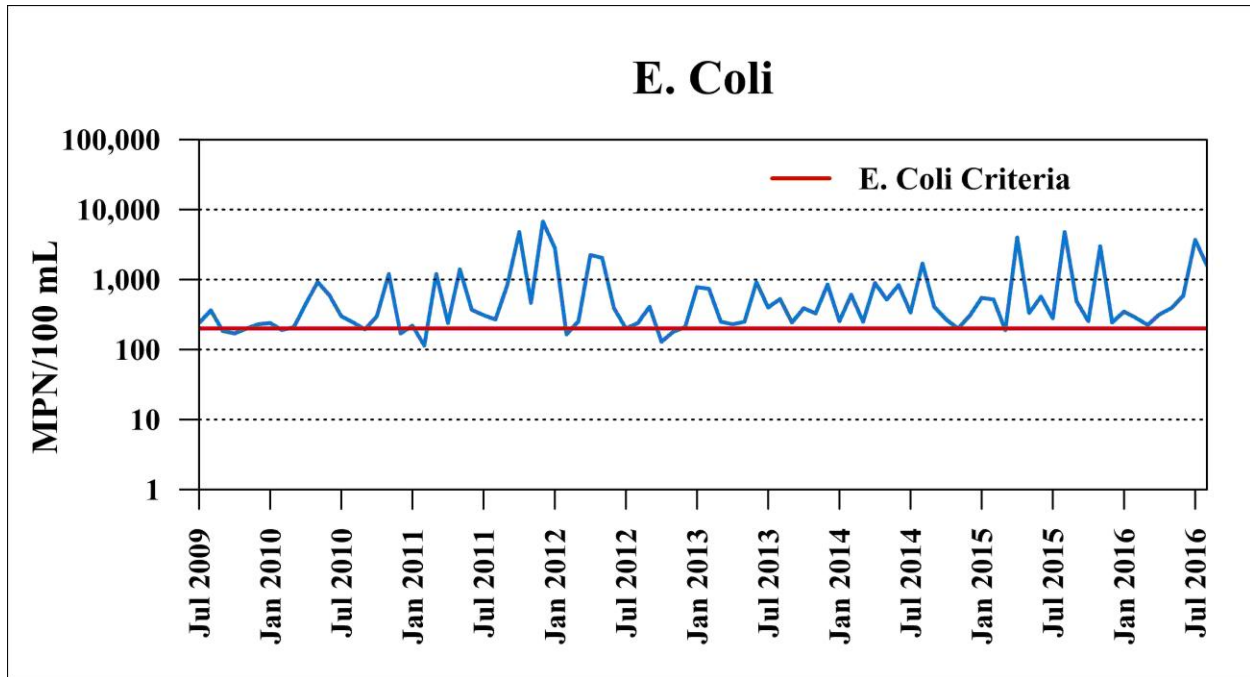


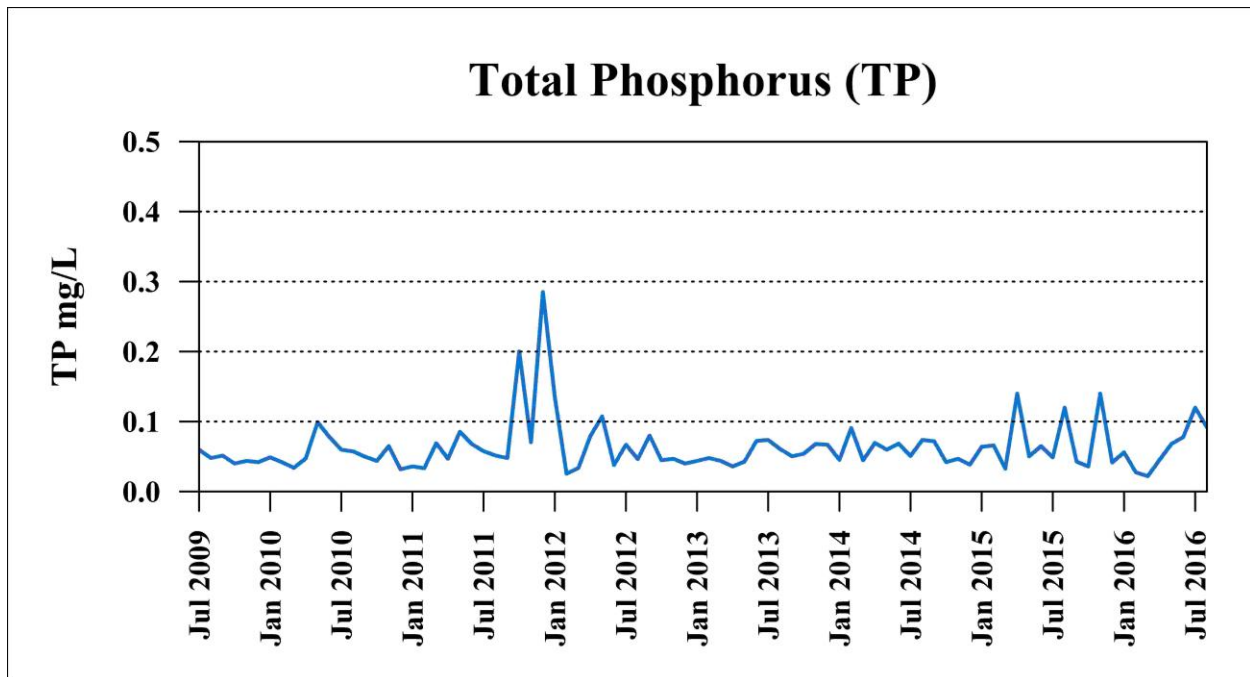
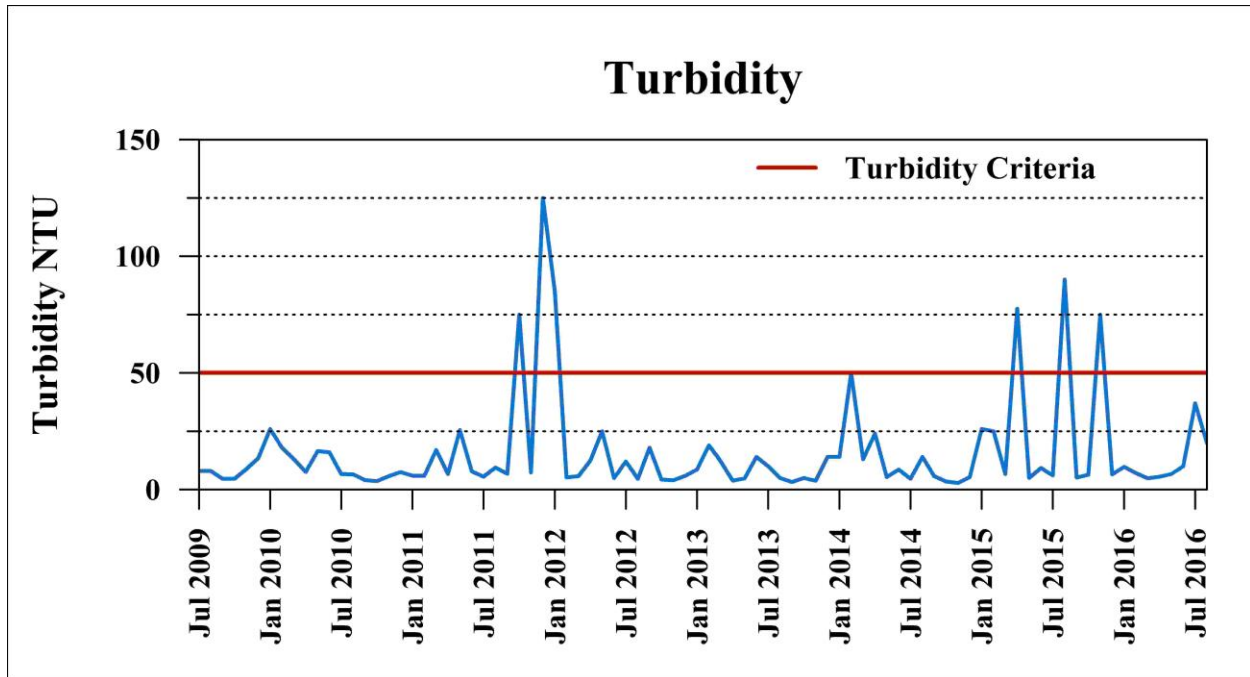
**Figure 10-3** shows analysis graphs for each non-metal parameter in the monitoring plan for the seven-year period from July 2009 to June 2016 (metals shown separately in Figure 10-4). Each

data point on the graph represents the median parameter value across all sites for each particular fixed interval sampling event. Although not enough data have been collected to show statistically significant trends in the seven-year period since monitoring began under the NPDES MS4 WQ monitoring plan, the graphs do show a slight improving trend for some parameters. Additional monitoring over time will be needed to move toward statistical relevance of the data.

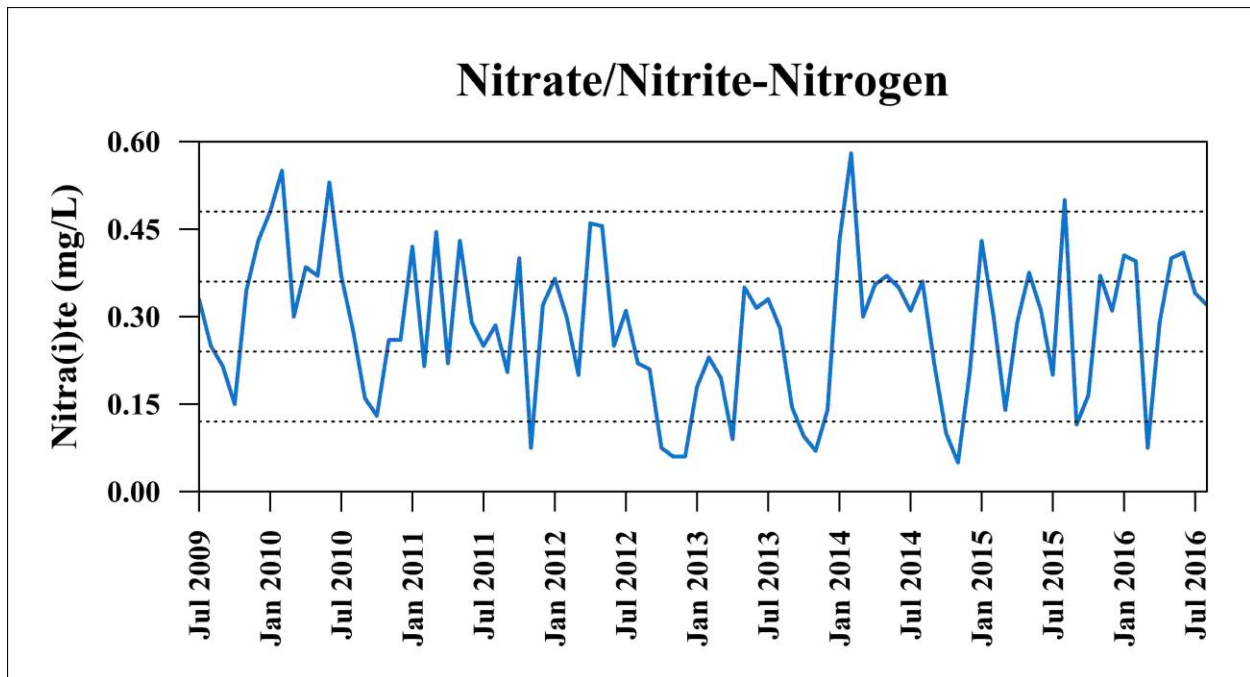
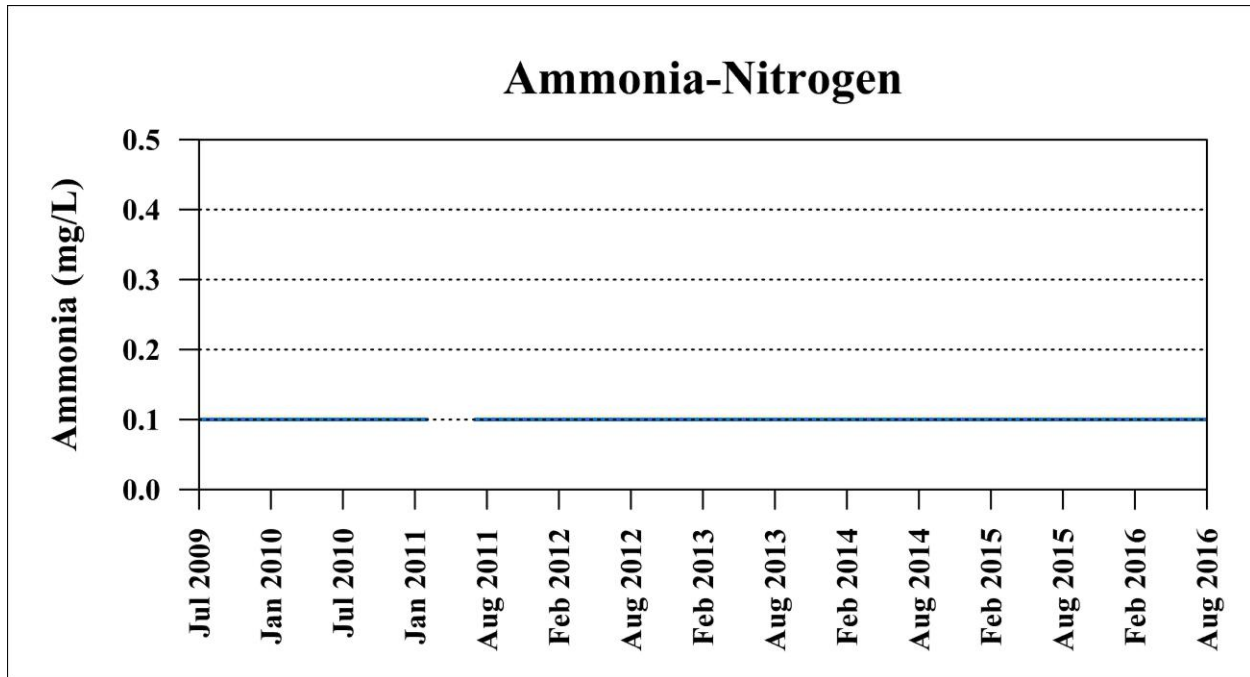
**FIGURE 10-3**

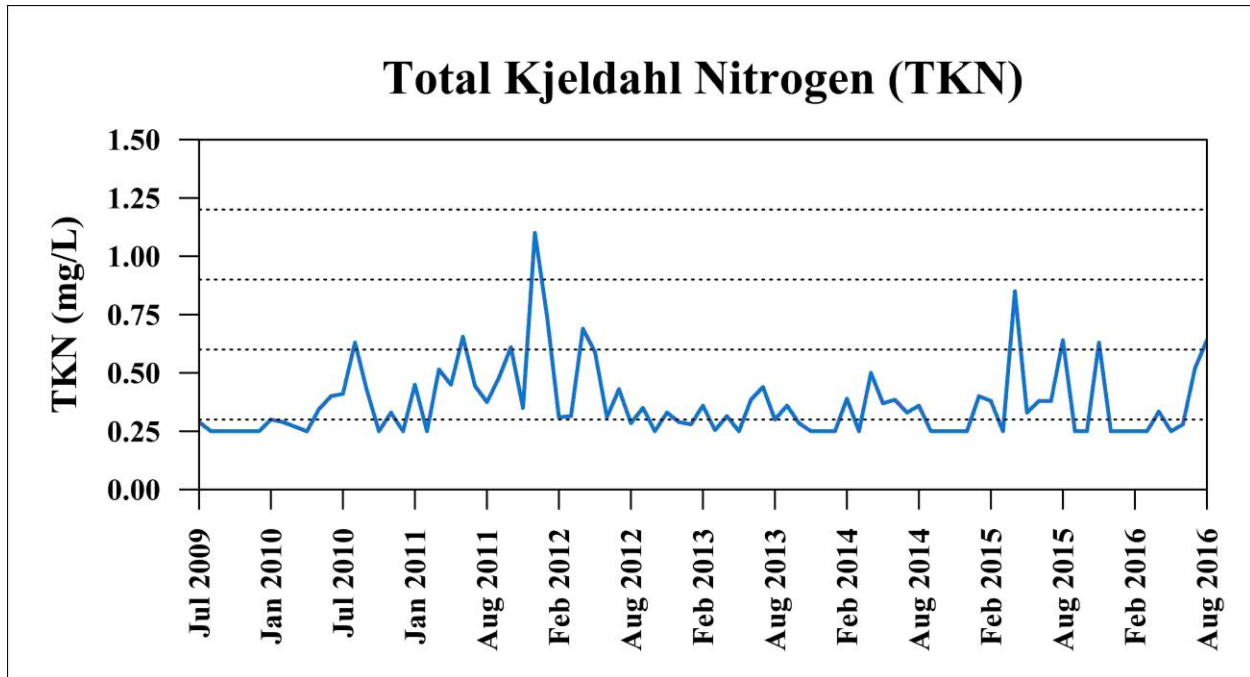


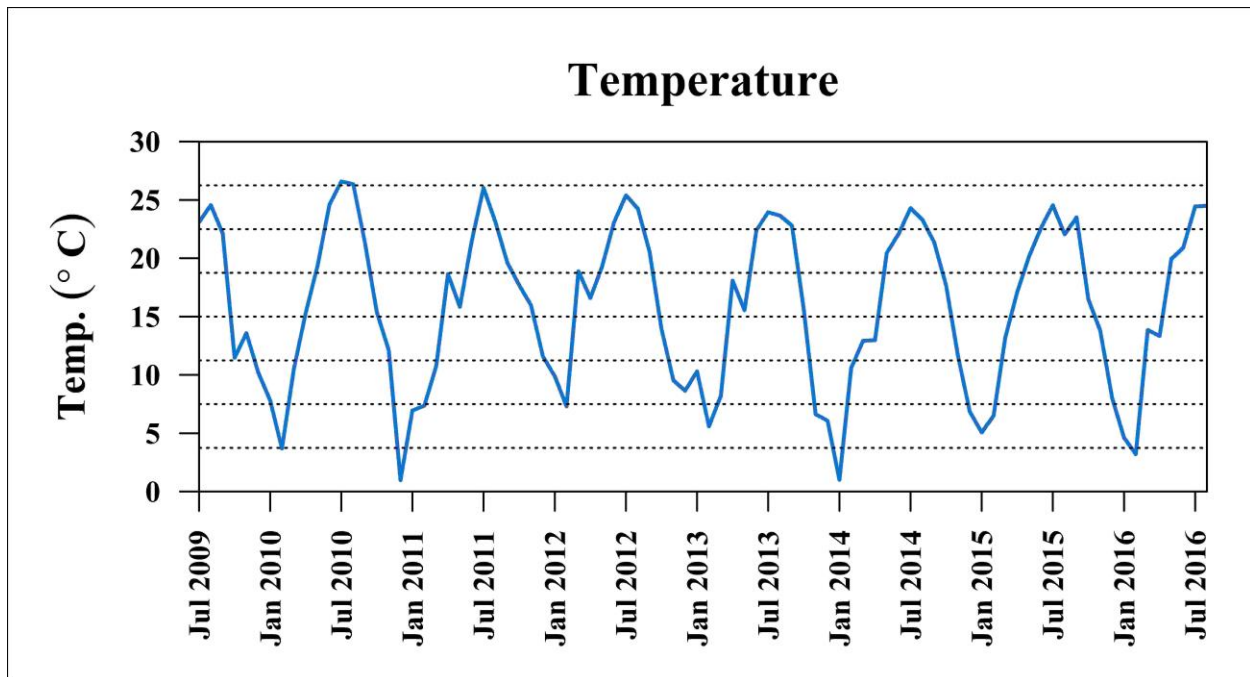
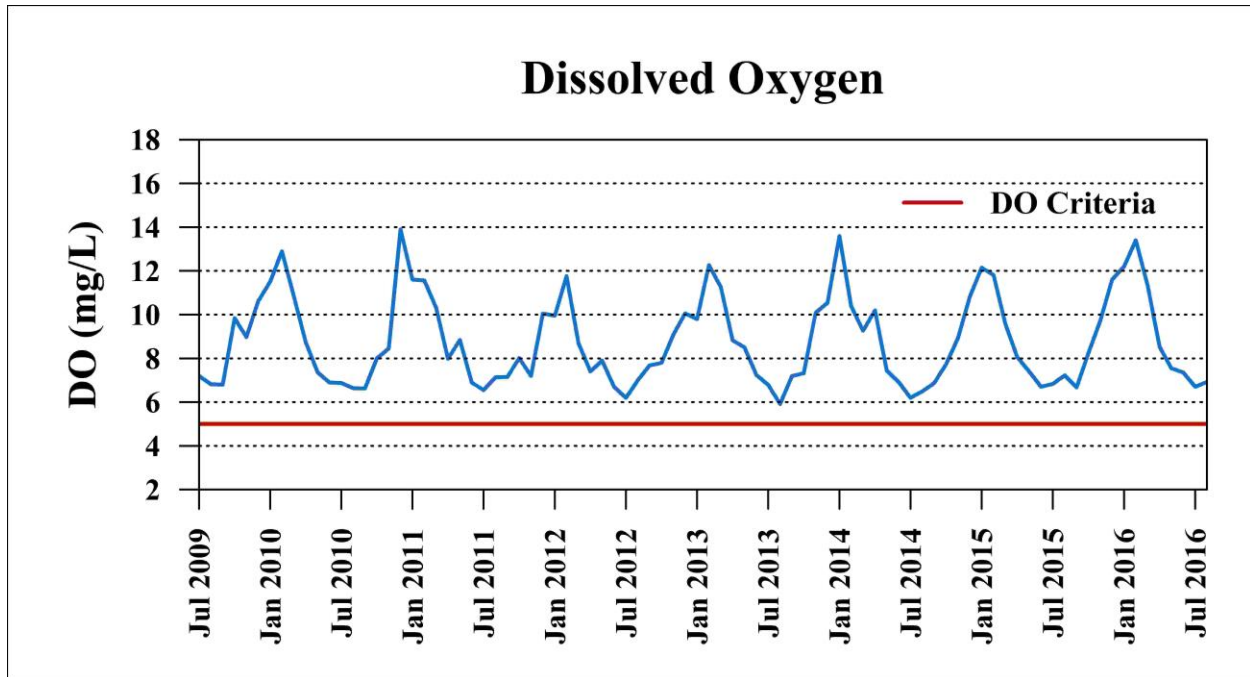


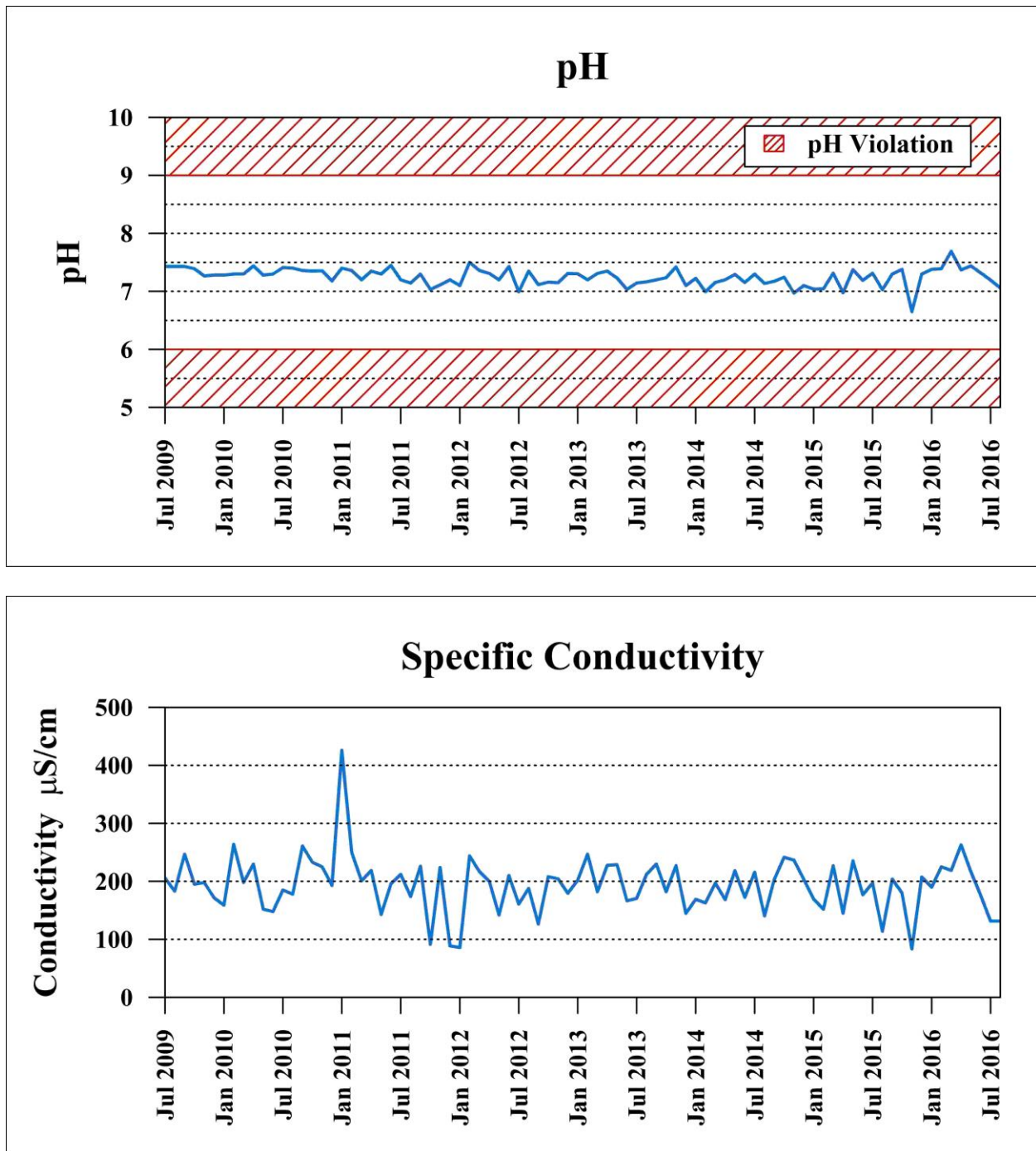










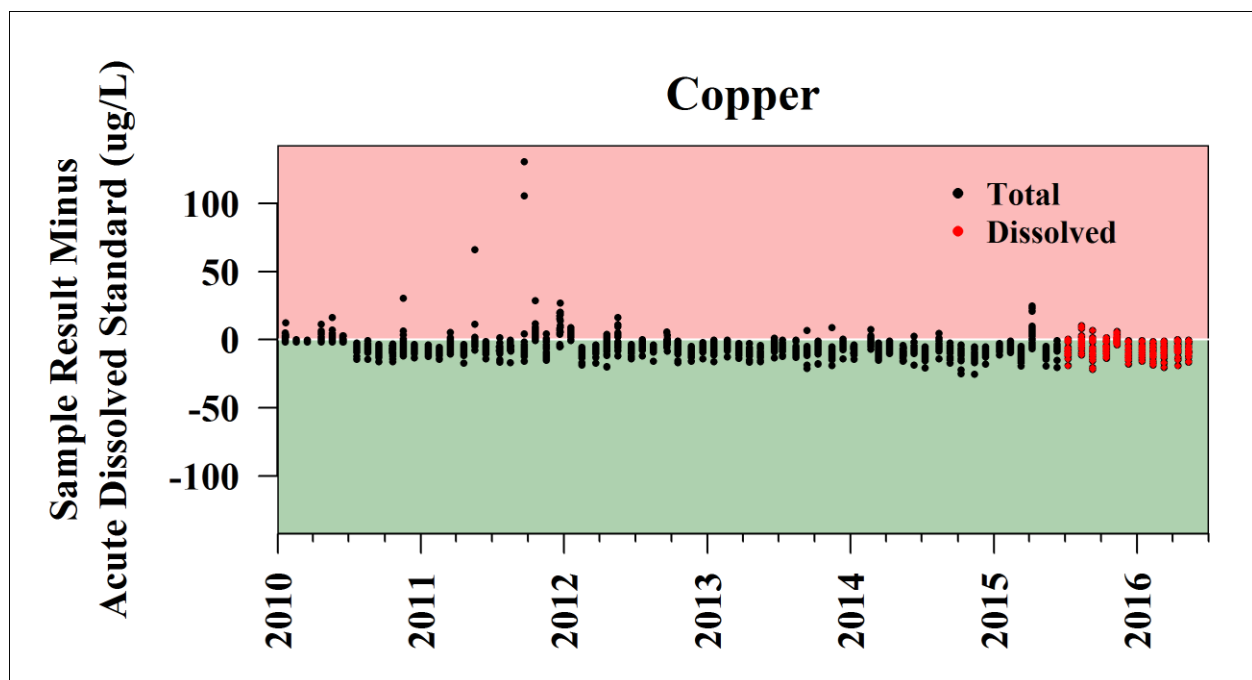


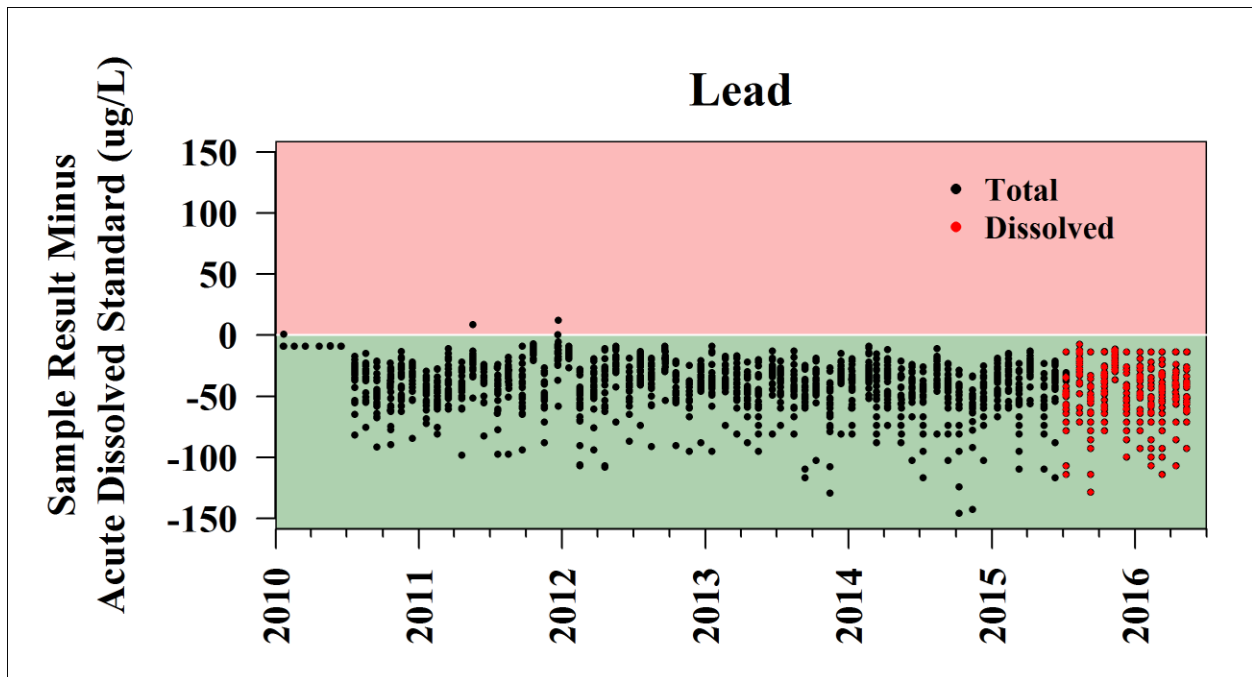
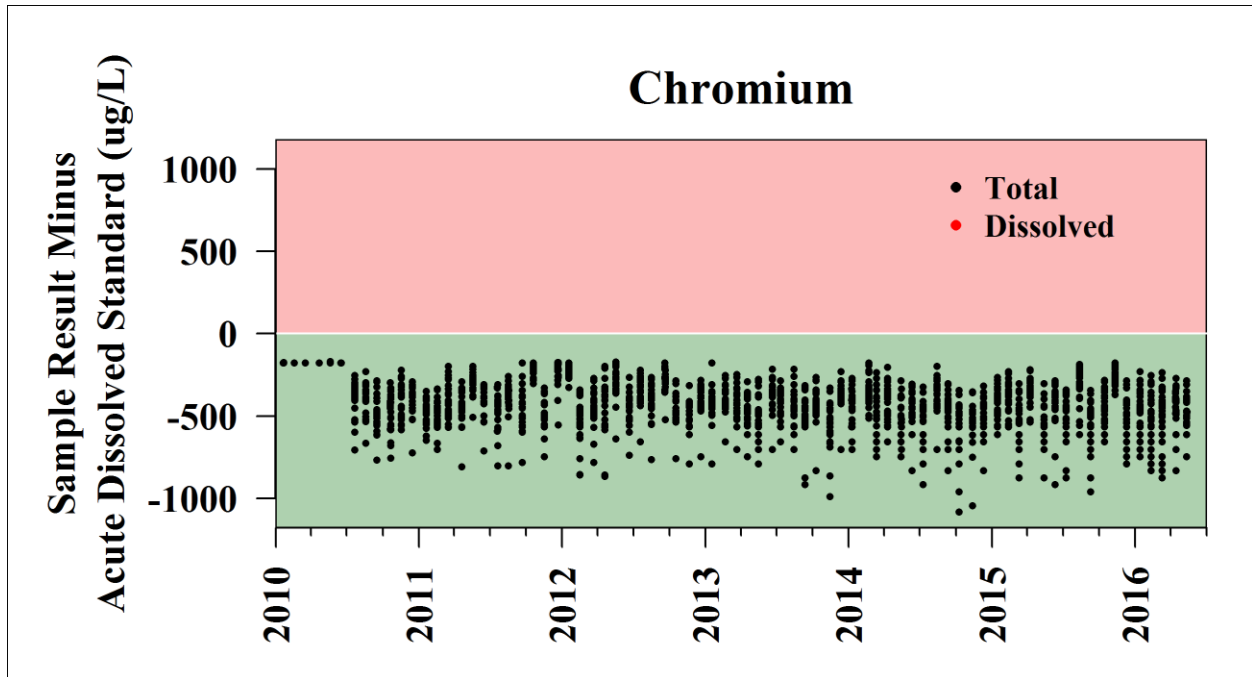
**Figure 10-4** shows data for the metals included in the monitoring plan for the period of January 2010 through June 2016. These data have been plotted as the difference between individual sample results and the acute dissolved standard at the sample's hardness value to better illustrate exceedances and non-exceedances on a temporal basis. As a result, the vertical axes represent how far above or below the standard a given sample was, as opposed to showing absolute sample

concentrations. Samples collected prior to implementation of the dissolved metals standards are also shown relative to the current dissolved metals standards, as this gives a better picture of historical toxicity.

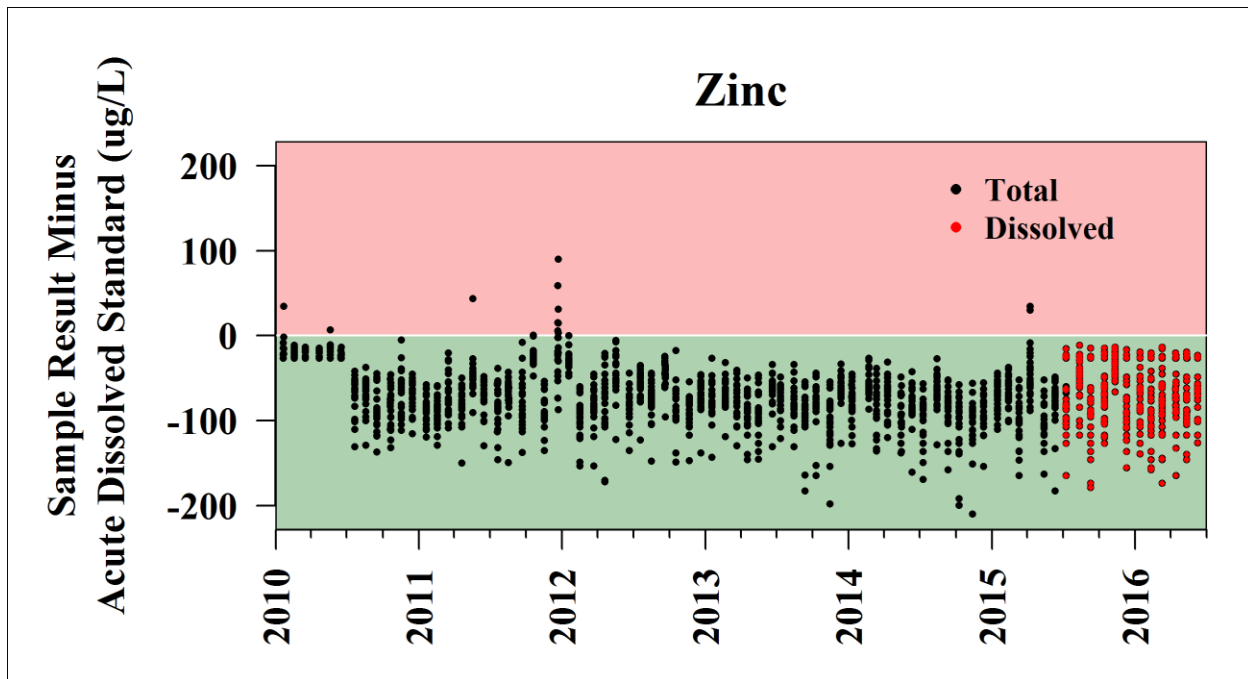
The City has analyzed fixed interval samples for dissolved copper, dissolved lead, and dissolved zinc since July 2015, given that historically total metals samples of those elements have exceeded the new dissolved metals standards at least once. For chromium, which has never exceeded the total metal standard or the more protective dissolved standard, the City continues to analyze on a total basis. It can be seen from **Figure 10-4** that copper is the only metal for which the dissolved standard has been exceeded since coming into effect in 2015.

**FIGURE 10-4**









## **Section 11: Total Maximum Daily Load (TMDL) Program**

The City will continue to develop and implement the following BMPs per the permit schedule and within the six minimum NPDES MS4 permit measures that are designed to reduce the TMDL pollutant of concern within the TMDL assigned MS4 NPDES regulated waste load allocation to the maximum extent practicable (MEP) within the impaired water bodies in the City’s jurisdiction that are subject to approved Total Maximum Daily Loads (TMDLs). The following sub-sections explain activities completed under this program as well as the BMPs implemented, measures of success, future goals and planned activities per BMP, and program assessment.

### **11.1 BMP Summary Table**

**Table 11-1** provides information concerning the BMPs to be implemented to fulfill the Total Maximum Daily Load (TMDL) Program requirements. Funding for the BMPs in this section is covered by local stormwater utility fees.

**Table 11-1:** BMP Summary Table for Total Maximum Daily Load (TMDL) Program.

BMP	BMP Description	Schedule (yrs)					Responsible Position
		1	2	3	4	5	
Identify, describe and map watershed, outfalls, and streams	Within 24 months the permittee shall prepare a plan that: <ul style="list-style-type: none"> <li>Identifies the watershed(s) subject to an approved TMDL with an approved Waste Load Allocation (WLAs) assigned to the permittee,</li> </ul>		X	X	X	X	Water Quality Program Manager

	<ul style="list-style-type: none"> <li>Includes a description of the watershed(s),</li> <li>Includes a map of watershed(s) showing streams &amp; outfalls</li> <li>Identifies the locations of currently known major outfalls within its corporate limits with the potential of contributing to the cause(s) of the impairment to the impaired segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments and</li> <li>Includes a schedule to discover and locate other major outfalls within its corporate limits that may be contributing to the cause of the impairment to the impaired stream segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments.</li> </ul>						
Existing measures	<p>Within 24 months the Permittee's plan :</p> <ul style="list-style-type: none"> <li>Shall describe existing measures being implemented by the Permittee designed to achieve the <u>MS4's NPDES WLA</u> and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies; and</li> <li>Provide an explanation as to how those measures are designed to reduce the TMDL pollutant of concern.</li> <li>The Permittee shall continue to implement the existing measures until notified by DWQ.</li> </ul>		X	X	X	X	Water Quality Program Manager
Assessment of available monitoring data	<p>Within 24 months the permittee's plan shall include an assessment of available monitoring data. Where long-term data is available, this assessment should include an analysis of the data to show trends.</p>		X	X	X	X	Water Quality Program Manager
Monitoring Plan	<p>Within 36 months the permittee shall develop and submit to the Division a Monitoring Plan for the permittee's assigned NPDES regulated WLA as specified in the TMDL. The permittee shall maintain and implement the Monitoring Plan as additional outfalls are identified and as accumulating data may suggest. Following any review and comment by the Division the permittee shall incorporate any necessary changes to monitoring plan and initiate the plan within six months. Modifications to the monitoring plan shall be approved by the Division. Upon request, the requirement to develop a Monitoring Plan may be waived by the Division if the existing and proposed measures are determined to be adequate to achieve the MS4's NPDES WLA to MEP within the watershed to which the TMDL applies.</p>			X	X	X	Water Quality Program Manager

Additional Measures	<p>Within 36 months the permittee's plan shall:</p> <ul style="list-style-type: none"> <li>Describe additional measures to be implemented by the permittee designed to achieve the permittee's MS4's NPDES WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies; and</li> <li>Provide an explanation as to how those measures are designed to achieve the permittee's MS4's NPDES regulated WLA to the MEP within the watershed to which the TMDL applies.</li> </ul>			X	X	X	Water Quality Program Manager
Implementation Plan	<p>Within 48 months the permittee's plan shall:</p> <ul style="list-style-type: none"> <li>Describe the measures to be implemented within the remainder of the permit term designed to achieve the MS4's NPDES WLA and to reduce the TMDL pollutant of concern to the MEP and</li> <li>Identify a schedule, subject to DWQ approval, for completing the activities.</li> </ul>				X	X	Water Quality Program Manager
Incremental Success	The permittee's plan must outline ways to track and report successes designed to achieve the MS4's NPDES regulated WLA and to reduce the TMDL pollutant of concern to MEP within the watershed to which the TMDL applies.				X	X	Water Quality Program Manager
Reporting	The permittee shall conduct and submit to the Division an annual assessment of the program designed to achieve the MS4's NPDES WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies. Any monitoring data and information generated from the previous year are to be submitted with each annual report.		X	X	X	X	Water Quality Program Manager

## 11.2 TMDL Watershed Plan

Per the permit schedule, the City developed a TMDL Watershed Plan in February 2015 and submitted the plan to NCDEQ-DEMLR. The plan covered all watersheds that have an approved TMDL within the City's jurisdiction and is included in **Appendix A** for reference. Relevant information from the Plan is provided in the sub-sections below.

### 11.2.1 TMDL Watershed Identification

Section 303(d) of the Clean Water Act (CWA) requires states to develop a list of waters not meeting water quality standards or that have impaired uses. This list, referred to as the 303(d)

list, is submitted biennially to the U.S. Environmental Protection Agency (EPA) for review. The 303(d) process requires that a TMDL be developed for each of the waters appearing on Part I of the 303(d) list. The objective of a TMDL is to allocate allowable pollutant loads to known sources so that actions may be taken to restore the water to its intended uses (EPA 1991).

As part of the TMDL watershed plan development during FY2015, the City reviewed the NCDENR-DWR website to determine which TMDLs were in place within the City’s jurisdiction. Currently, there are seven approved TMDLs applicable to multiple streams in the City of Charlotte and Mecklenburg County. **Table 11-2** and **Figure 11-1** provide information on, and an illustration of, these TMDLs and affected watersheds. Additional information concerning these TMDLs is provided in **Appendix A**.

### 11.2.2 Outfall Identification for TMDL Watersheds

As part of the development of the TMDL watershed plan, during FY2015 the City developed an existing outfall inventory of the applicable TMDL watersheds. This inventory will be maintained using a GIS coverage to show existing outfalls within the TMDL watersheds that have the potential of contributing to the cause(s) of the impairment to the impaired segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments. Additional information on the outfall inventory is included in **Appendix A**.

**Table 11-2:** City of Charlotte Streams with Approved TMDLs

Receiving Stream Name	WQ Classification	TMDL Approved	TMDL Pollutant of Concern
Irwin Creek	C	February 1996	Dissolved Oxygen
Little Sugar Creek	C	February 1996	Dissolved Oxygen
McAlpine Creek	C	February 1996	Dissolved Oxygen
Lake Wylie	WS-IV, B, CA	February 1996	Chlorophyll-a
Irwin Creek	C	March 2002	Fecal Coliform
Little Sugar Creek	C	March 2002	Fecal Coliform
McAlpine Creek	C	March 2002	Fecal Coliform
Sugar Creek	C	March 2002	Fecal Coliform
McKee Creek	C	August 2003	Fecal Coliform
Irwin Creek	C	February 2005	Turbidity
Little Sugar Creek	C	February 2005	Turbidity
Long Creek	C	February 2005	Turbidity
McAlpine Creek	C	February 2005	Turbidity
Sugar Creek	C	February 2005	Turbidity
Steele Creek	C	May 2007	Fecal Coliform
Statewide	All	October 2012	Mercury

Source: 2014 NCDENR-Division of Water Resources website:

<http://portal.ncdenr.org/web/wq/ps/mtu/tmdl/tmdls#Catawba>

### 11.3 Identification of Existing Measures

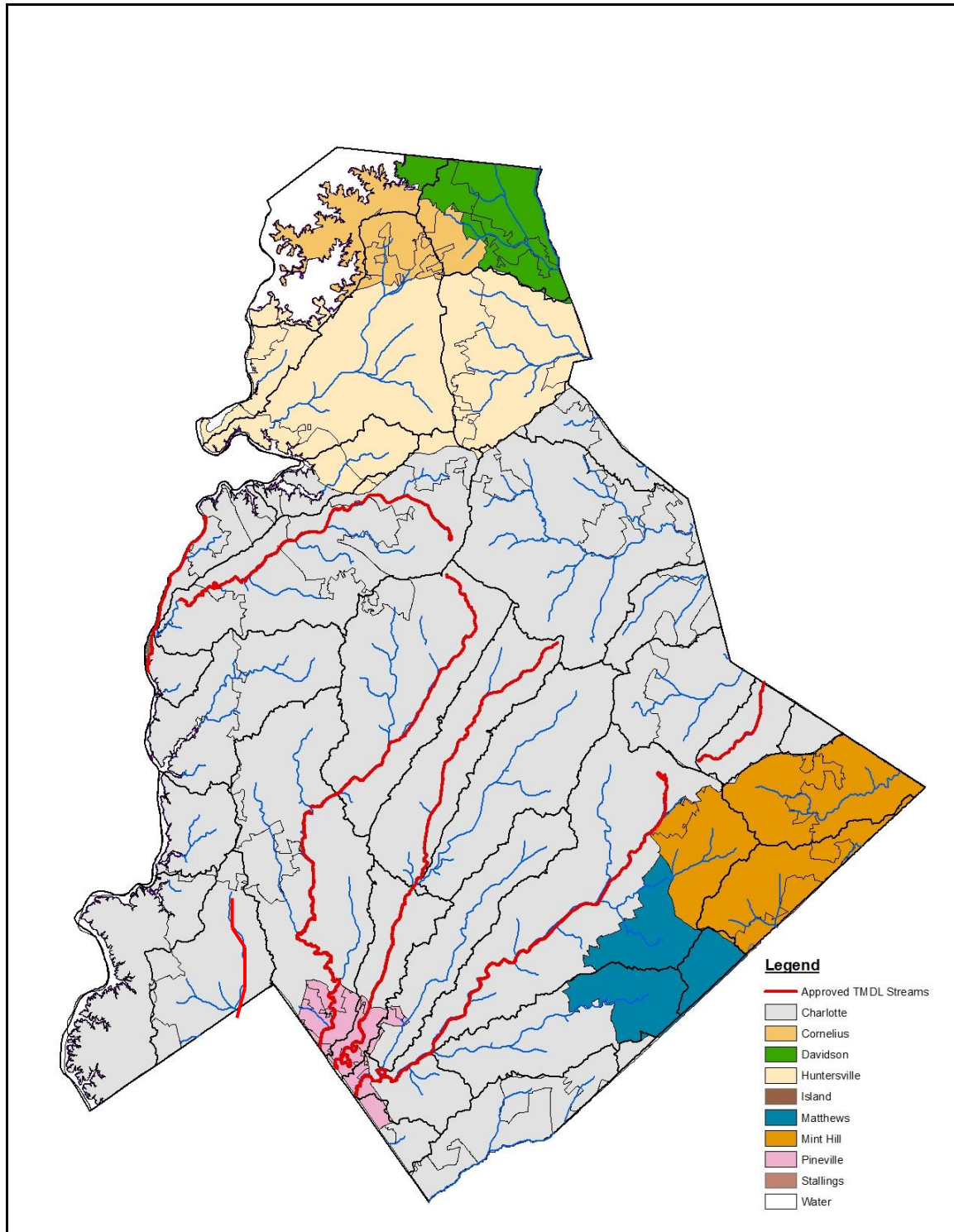
As part of the development of the TMDL watershed plan, during FY2015 the City identified existing programs and measures which are currently in use within the City’s NPDES MS4 permit and water quality monitoring programs that are designed to address the assigned MS4 NPDES

regulated WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies. Additional information on the existing measures is included in **Appendix A**.

#### 11.4 Assessment of Available Monitoring Data

As part of the development of the TMDL watershed plan, during FY2015 the City conducted an assessment of existing monitoring data for each TMDL pollutant of concern in the identified TMDL watersheds. Current and historical data were utilized to determine trends, where possible. Additional information on the data assessment is included in **Appendix A**.

**FIGURE 11-1**  
**Charlotte Approved TMDL Streams**





#### 11.5 Monitoring Plan for Assigned MS4 NPDES Regulated Waste Load Allocation

As part of the TMDL watershed plan, during FY2016 the City developed a monitoring plan, shown in **Appendix B**, for each pollutant of concern with an assigned MS4 NPDES regulated WLA within each watershed with an approved TMDL within the City's jurisdiction. The purpose of the monitoring plan is to guide activities for data collection and assessment of pollutants of concern as well as to evaluate the effectiveness of achieving the regulated waste load allocation (WLA) identified within the TMDL. In developing the monitoring plan, sample locations were selected to assess water quality conditions within each TMDL watershed. Selection of sample locations took into consideration upland land use, permitted dischargers, dry weather flows from the storm drainage system, and the possible effects of converging tributaries.

The monitoring plan details each sample location by written description, sample type, and frequency, as well as setting forth a monitoring schedule for each pollutant of concern. The monitoring plan also identifies in-stream locations deemed necessary to support assessment of activities in the TMDL Watershed Plan to address the assigned MS4 NPDES regulated Waste Load Allocation (WLA) identified in the TMDL.

#### 11.6 Identification of Additional Measures

As part of the TMDL watershed plan, during FY2016 the City identified additional measures, shown in **Appendix A**, for implementation within the City's MS4 permit program that are designed to achieve the assigned MS4 NPDES regulated WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies. The plan also discusses how the additional measures are designed to reduce the TMDL pollutant of concern.

#### 11.7 Implementation of Additional Measures

No activities were required by the current NPDES MS4 permit for FY2016. Per the permit schedule and within the TMDL watershed plan, the City will develop an implementation plan and schedule to describe additional programs and measures that have been identified as necessary for implementation within the City's MS4 permit program that are designed to achieve the assigned MS4 NPDES regulated WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies.

#### 11.8 Tracking Incremental Success

Activities conducted to promote incremental success within the TMDL plan are tracked and discussed in **Appendix A**.

#### 11.9 Measurable Goals

**Table 11-5** describes the various Total Maximum Daily Load (TMDL) Program BMPs and the Measurable Goals for each BMP by permit term year.

**Table 11-5: BMP Measurable Goals for Total Maximum Daily Load (TMDL) Program.**

BMP	BMP Description	Measurable Goals (by permit term year)				
		1	2	3	4	5
Identify, describe and map watershed, outfalls, and streams	<p>Within 24 months the permittee shall prepare a plan that:</p> <ul style="list-style-type: none"> <li>Identifies the watershed(s) subject to an approved TMDL with an approved Waste Load Allocation (WLAs) assigned to the permittee,</li> <li>Includes a description of the watershed(s),</li> <li>Includes a map of watershed(s) showing streams &amp; outfalls</li> <li>Identifies the locations of currently known major outfalls within its corporate limits with the potential of contributing to the cause(s) of the impairment to the impaired segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments and</li> <li>Includes a schedule to discover and locate other major outfalls within its corporate limits that may be contributing to the cause of the impairment to the impaired stream segments, to their tributaries, and to segments and tributaries within the watershed contributing to the impaired segments.</li> </ul>	None	Develop TMDL Watershed Plan per requirements of the MS4 permit by Feb 28, 2015.	Update TMDL Watershed Plan as necessary.	Update TMDL Watershed Plan as necessary.	Update TMDL Watershed Plan as necessary.
Existing measures	<p>Within 24 months the Permittee's plan:</p> <ul style="list-style-type: none"> <li>Shall describe existing measures being implemented by the Permittee designed to achieve the</li> </ul>	None	Identify existing measures within TMDL plan by Feb 28, 2015.	Continue to implement existing measures per TMDL plan.	Continue to implement existing measures per TMDL plan.	Continue to implement existing measures per TMDL plan.

	<p><u>MS4's NPDES WLA</u> and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies; and</p> <ul style="list-style-type: none"> <li>• Provide an explanation as to how those measures are designed to reduce the TMDL pollutant of concern.</li> <li>• The Permittee shall continue to implement the existing measures until notified by DWQ.</li> </ul>					
Assessment of available monitoring data	Within 24 months the permittee's plan shall include an assessment of available monitoring data. Where long-term data is available, this assessment should include an analysis of the data to show trends.	None	Conduct a review and assessment of available monitoring data by Feb 28, 2015.	Continue to review and assess monitoring data as it becomes available.	Continue to review and assess monitoring data as it becomes available.	Continue to review and assess monitoring data as it becomes available.
Monitoring Plan	Within 36 months the permittee shall develop and submit to the Division a Monitoring Plan for the permittee's assigned NPDES regulated WLA as specified in the TMDL. The permittee shall maintain and implement the Monitoring Plan as additional outfalls are identified and as accumulating data may suggest. Following any review and comment by the Division the permittee shall incorporate any necessary changes to monitoring plan and initiate the plan within six months. Modifications to the monitoring plan shall be approved by the Division. Upon request, the requirement to develop a Monitoring Plan may be waived by the Division if the existing and proposed measures are determined to be adequate to	None	None	Develop monitoring plan for each TMDL watershed for the TMDL pollutants of concern by Feb 28, 2016.	Complete monitoring activities specified in the plan by June 30, 2017. Assess monitoring data collected under the monitoring plan to determine effectiveness of Water Quality Programs by December 31, 2017. Update monitoring plan as necessary based on data review and assessment activities.	Complete monitoring activities specified in the plan by June 30, 2018. Assess monitoring data collected under the monitoring plan to determine effectiveness of Water Quality Programs by December 31, 2018. Update monitoring plan as necessary based on data review and assessment activities.



	achieve the MS4's NPDES WLA to MEP within the watershed to which the TMDL applies.					
Additional Measures	<p>Within 36 months the permittee's plan shall:</p> <ul style="list-style-type: none"> <li>Describe additional measures to be implemented by the permittee designed to achieve the permittee's MS4's NPDES WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies; and</li> <li>Provide an explanation as to how those measures are designed to achieve the permittee's MS4's NPDES regulated WLA to the MEP within the watershed to which the TMDL applies.</li> </ul>	None	None	Determine additional measures that may be needed to achieve assigned MS4 NPDES regulated WLA and address TMDL pollutant of concern by Feb 28, 2016.	Continue to evaluate and update additional measures per TMDL plan, as needed.	Continue to evaluate and update additional measures per TMDL plan, as needed.
Implementation Plan	<p>Within 48 months the permittee's plan shall:</p> <ul style="list-style-type: none"> <li>Describe the measures to be implemented within the remainder of the permit term designed to achieve the MS4's NPDES WLA and to reduce the TMDL pollutant of concern to the MEP and</li> <li>Identify a schedule, subject to DWQ approval, for completing the activities.</li> </ul>	None	None	None	Develop an implementation plan for identified additional measures that may be needed to achieve assigned MS4 NPDES regulated WLA and address TMDL pollutant of concern by Feb 28, 2017.	Continue to implement additional measures per the plan.
Incremental Success	The permittee's plan must outline ways to track and report successes designed to achieve the MS4's NPDES regulated WLA and to reduce	None	None	None	Develop a methodology to track and report data and successes for	Continue to track and report successes per the plan.



	the TMDL pollutant of concern to MEP within the watershed to which the TMDL applies.				identified additional measures that may be needed to achieve assigned MS4 NPDES regulated WLA and address TMDL pollutant of concern by June 30, 2017.	
Reporting	The permittee shall conduct and submit to the Division an annual assessment of the program designed to achieve the MS4's NPDES WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies. Any monitoring data and information generated from the previous year are to be submitted with each annual report.	None	Prepare an annual assessment of activities and data analysis for the TMDL watershed plan. Provide this information in the NPDES MS4 permit annual report.	Prepare an annual assessment of activities and data analysis for the TMDL watershed plan. Provide this information in the NPDES MS4 permit annual report.	Prepare an annual assessment of activities and data analysis for the TMDL watershed plan. Provide this information in the NPDES MS4 permit annual report.	Prepare an annual assessment of activities and data analysis for the TMDL watershed plan. Provide this information in the NPDES MS4 permit annual report.

#### 11.10 Program Assessment and Reporting

During FY2016, the City completed the development of the TMDL watershed monitoring plan and identification of additional BMP measures as required by the permit. Per the permit schedule and TMDL watershed plan, the City will assess and report on the overall success of the TMDL program and plan in subsequent annual reports, as shown in **Appendix A**. Success will be measured through the development and implementation of the TMDL watershed plan, and implementation of monitoring and data collection and assessment activities, all designed to achieve the MS4's assigned NPDES regulated WLA and to reduce the TMDL pollutant of concern to the MEP within the watershed to which the TMDL applies. Success will also be measured by the number of samples collected, number of parameters analyzed, and data analysis to determine trends.



## APPENDIX A

### City of Charlotte NPDES MS4 TMDL Watershed Plan

#### **Section 1: Purpose**

The purpose of this Total Maximum Daily Load (TMDL) Watershed Plan is to address the assigned municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) regulated waste load allocations (WLAs) of applicable TMDLs approved for water bodies located within the City of Charlotte, the City's Extra Territorial Jurisdiction (ETJ) area, and applicable watersheds in Mecklenburg County, including Long Creek, Sugar Creek, Little Sugar Creek, and McAlpine Creek. Specifically, the goal of the plan is to facilitate the implementation of activities within the NPDES MS4 permit program six minimum measures that are designed to reduce the TMDL assigned MS4 NPDES regulated WLAs for the pollutant of concern to the maximum extent practicable (MEP). This TMDL Watershed Plan is intended to meet the requirements of the City's NPDES Phase I MS4 permit, and also the requirements of Mecklenburg County's NPDES Phase II MS4 permit for TMDL watershed areas located both within the City and County.

In addition, Part II, Sec J.3 of the City's NPDES MS4 permit requires that the City address any approved TMDLs that do not assign an MS4 NPDES regulated WLA for the pollutant of concern. This is to be done by evaluating strategies and tailoring best management practices (BMPs) within the scope of the six minimum permit measures to address the pollutant of concern to the MEP. All BMP measures included in this TMDL Watershed Plan are designed to address a pollutant of concern in the same manner regardless of whether or not a MS4 NPDES regulated WLA has been assigned. As such, the City has included all approved TMDLs within this plan.

#### **Section 2: Background**

Section 303(d) of the Clean Water Act (CWA) requires states to develop a list of waters not meeting water quality standards or that have impaired uses. This list, referred to as the 303(d) list, is submitted biennially to the U.S. Environmental Protection Agency (EPA) for review. The 303(d) process requires that a TMDL be developed for waters shown on Part I of the 303(d) list. The objective of a TMDL is to allocate allowable pollutant loads to known sources so that actions may be taken to restore the water to its intended uses (EPA 1991). Currently, there are seven approved TMDLs applicable to multiple streams in the City of Charlotte and Mecklenburg County. **Table 2-1** provides information on these TMDLs and affected stream watersheds. The following sub-sections elaborate on these TMDLs.

**Table 2-1: City of Charlotte Streams with Approved TMDLs**

Receiving Stream Name	WQ Classification	TMDL Approved	TMDL Pollutant of Concern
Irwin Creek	C	February 1996	Dissolved Oxygen
Little Sugar Creek	C	February 1996	Dissolved Oxygen
McAlpine Creek	C	February 1996	Dissolved Oxygen

Lake Wylie	WS-IV, B, CA	February 1996	Chlorophyll-a
Irwin Creek	C	March 2002	Fecal Coliform
Little Sugar Creek	C	March 2002	Fecal Coliform
McAlpine Creek	C	March 2002	Fecal Coliform
Sugar Creek	C	March 2002	Fecal Coliform
McKee Creek	C	August 2003	Fecal Coliform
Irwin Creek	C	February 2005	Turbidity
Little Sugar Creek	C	February 2005	Turbidity
Long Creek	C	February 2005	Turbidity
McAlpine Creek	C	February 2005	Turbidity
Sugar Creek	C	February 2005	Turbidity
Steele Creek	C	May 2007	Fecal Coliform
Statewide	All	October 2012	Mercury

Source: 2014 NCDENR-Division of Water Resources website:

<http://portal.ncdenr.org/web/wq/ps/mtu/tmdl/tmdls#Catawba>

## 2.1 Fecal Coliform TMDLs

Fecal coliform in urban streams can originate from many sources including both point and non-point sources. Some sources of fecal coliform in urban watersheds include wildlife, pet waste, failing septic systems, cross connections resulting in dry weather flow in stormwater outfalls; sanitary sewer overflows (SSOs), sewer exfiltration, and permitted discharges such as wastewater treatment plants (WWTPs). The North Carolina (NC) in-stream standard for fecal coliform is a 30-day geometric mean of 200 cfu/100 mL or a daily maximum value of 400 cfu/100 mL (15A NCAC 2B .0211 (3)(e)). In 2002, a fecal coliform TMDL was written for Irwin, McAlpine, Little Sugar and Sugar Creek watersheds because these watersheds demonstrated a greater than 10% exceedance of the 400 cfu/100 mL standard. This TMDL set WLAs for NPDES permitted WWTPs and SSOs; and load allocations (LAs) for wildlife, failing septic systems, dry weather flows from the MS4, and sewer exfiltration. No MS4 NPDES WLA was assigned under this TMDL. Nevertheless, fecal coliform will be addressed under this plan as discussed in Section 1.

In 2003, a fecal coliform TMDL was written for the McKee Creek watershed by EPA in cooperation with the NC Department of Environment and Natural Resources (NCDENR), now NCDEQ. Unlike the fecal coliform TMDL written in 2002, this TMDL included a wet weather WLA for the stormwater outfalls. Aside from the wet weather WLA, a WLA was assigned to continuous discharge facilities, which were privately operated smaller “package” WWTPs. Agricultural runoff, septic systems, urban runoff, and wildlife were identified as nonpoint sources of fecal coliform for the purpose of determining the LA for the TMDL. The MS4 NPDES WLA assigned for this TMDL is 8.16E+09 cfu/day.

In 2007, a fecal coliform TMDL was developed for Steele Creek by the South Carolina Department of Health and Environmental Control (SCDHEC). The majority of the Steele Creek watershed is located in South Carolina (SC); however, the creek originates in Charlotte-Mecklenburg. The TMDL compliance points for this water body/pollutant combination are all located in SC. According to SC fecal coliform standards, fecal coliform must not exceed 200

cfu/100 mL based on a geometric mean of five consecutive samples during a 30-day period, or no more than 10% of samples in a five year period may exceed 400 cfu/100 mL (SCDHEC, 2004c). WLAs were developed for continuous flow sources and NPDES permitted stormwater discharges, which were called “intermittent sources”. This TMDL states that the City of Charlotte will need to reduce its combined WLA for stormwater discharges by 87% in order to meet the TMDL at compliance point CW-009 just downstream of the North Carolina-South Carolina border.

## 2.2 Turbidity TMDL

In 2005, NCDENR, now NCDEQ, developed a turbidity TMDL for Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, and Irwin Creek within the City and County. This TMDL was written because the State’s turbidity data for these watersheds demonstrated a greater than 10% exceedance of the 50 Nephelometric Turbidity Unit (NTU) turbidity standard. While the impairment and subsequent TMDL were based on exceedance of the turbidity standard, total suspended solids (TSS) was used as a surrogate for the purpose of calculating WLAs for this TMDL. Point sources of turbidity/TSS identified in this TMDL included permitted construction sites and nonpoint sources of sediment identified including the following:

- Natural erosion occurring from the weathering of soils, rocks, and uncultivated land; geological abrasion; and other natural phenomena<sup>1</sup>.
- Erosion from agricultural activities. This erosion can be due to the large land area involved and the land-disturbing effects of cultivation. Grazing livestock can leave areas of ground with little vegetative cover. Unconfined animals with direct access to streams can cause stream bank damage and erosion<sup>1</sup>.
- Erosion from unpaved roadways can be a significant source of sediment to rivers and streams. Exposed soils, high runoff velocities and volumes and poor road compaction all increase the potential for erosion<sup>1</sup>.
- Runoff from active or abandoned mines may be a significant source of solids loading. Mining activities typically involve removal of vegetation, displacement of soils and other significant land disturbing activities<sup>1</sup>.
- Soil erosion from forested land that occurs during timber harvesting and reforestation activities. Timber harvesting includes the layout of access roads, log decks, and skid trails; the construction and stabilization of these areas; and the cutting of trees. Established forest areas produce very little erosion<sup>1</sup>.
- Stream bank and streambed erosion processes often contribute a significant portion of the overall sediment budget. The consequence of increased stream bank erosion is both water quality degradation as well as increased stream channel instability and accelerated sediment yields. Stream bank erosion can be traced to two major factors: stream bank characteristics (erodibility potential) and hydraulic/gravitational forces (Rosgen, online)<sup>1</sup>. The predominant processes of stream bank erosion include: surface erosion, mass failure (planar and rotational), fluvial entrainment (particle detachment by flowing water, generally at the bank toe), freeze-thaw, dry ravel, ice scour, liquifaction/collapse, positive pore water pressure, both saturated and unsaturated failures and soil piping (NCDENR 2005).<sup>1</sup>

This TMDL indicated that, of all the stream watersheds included in this TMDL, all but Long Creek demonstrated a less than 10% exceedance of the 50 NTU standard based on the 1997-2004 data. Consequently, a WLA in this TMDL was developed only for Long Creek. A natural background TSS WLA for the MS4 area was set at 324.6 lbs/day at 15.3 cfs flow, and an additional allocation of 675.4 lbs/day at 15.3 cfs flow, for a total WLA of 1000 lbs/day at 15.3 cfs.

### 2.3 Dissolved Oxygen TMDL

In 1996, NCDENR, now NCDEQ, developed a dissolved oxygen TMDL for Irwin Creek, McAlpine Creek, and Little Sugar Creek. In this TMDL, summer and winter WLAs for flow, BOD5, and NH3-N were assigned for the Irwin Creek WWTP, McAlpine Creek WWTP, and Sugar Creek WWTP. This TMDL acknowledged that Little Sugar Creek was also impacted by urban stormwater, but stated that the City of Charlotte is covered by the NPDES stormwater requirements. No MS4 NPDES WLA for BOD5 or NH3-N was assigned for this TMDL.

### 2.4 Chlorophyll a

In 1995, a TMDL for chlorophyll a was developed by NCDENR, now NCDEQ, for Lake Wylie. This TMDL set total nitrogen (TN) and total phosphorus (TP) limits for WWTPs discharging to Lake Wylie. Mecklenburg County conducts an annual assessment in response to this TMDL that is then submitted to NCDEQ in compliance with their Phase II NPDES MS4 permit.

### 2.5 Mercury TMDL

In 2012, NCDENR, now NCDEQ, developed a statewide mercury TMDL to determine how wastewater discharges, in-state air sources, and out-of-state air sources contribute to the surface water mercury load. This TMDL acknowledged that most mercury in stormwater comes from atmospheric deposition and that concentrations in stormwater are typically within the same range as mercury concentrations in rainwater, between zero and 10 ng/L. No MS4 NPDES WLA for mercury was assigned for this TMDL.

## **Section 3: Watershed Characteristics**

### 3.1 Long Creek Watershed

The Long Creek watershed includes portions of the City of Charlotte and drains north central Mecklenburg County between Charlotte and Huntersville in the Southern Outer Piedmont Ecoregion. The watershed is located within hydrologic unit 03050101 and includes Vance's Twin Lakes, Dixon Branch, Swaringer Lake and McIntyre Creek (NCDENR 2005).<sup>1</sup>

According to the 2000 US Census Urbanized Area, the Long Creek watershed includes portions of the Charlotte "urbanized area." The total Phase I & II area included as part of the Charlotte urbanized area within the Long Creek watershed is approximately 13,817 acres (21.5 mi<sup>2</sup>), or

approximately 59.5% of the total Long Creek watershed (NCDENR 2005).<sup>1</sup> The Long Creek drainage area is approximately 36.3 square miles with about 5.3% impervious cover.

**Figures 3-1 through 3-3** below show the location of Long Creek watershed within the Charlotte-Mecklenburg area, the Long Creek watershed impaired reach and tributary streams, and the Long Creek watershed land uses, respectively.

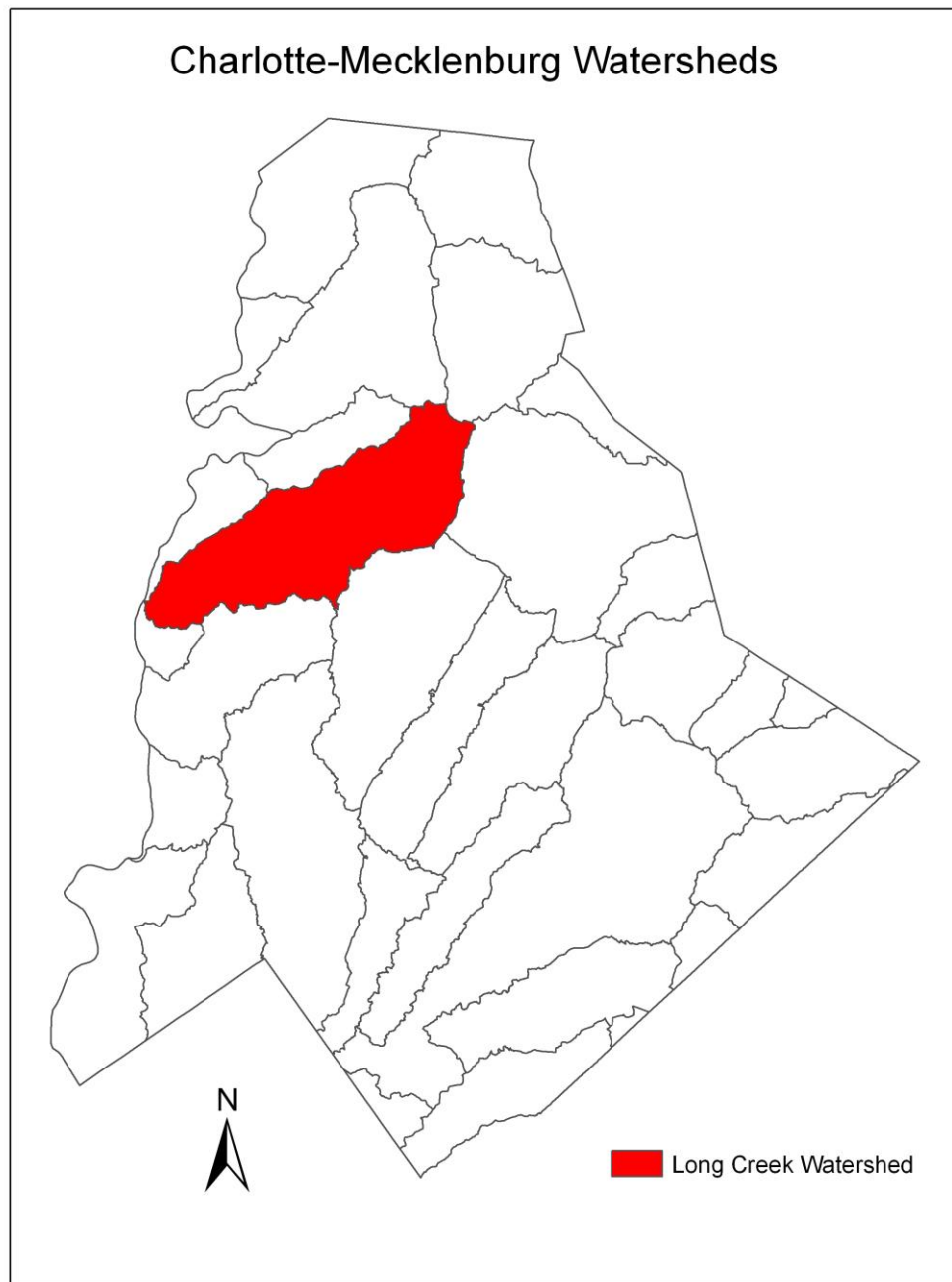


Figure 3-1: Charlotte-Mecklenburg Watersheds

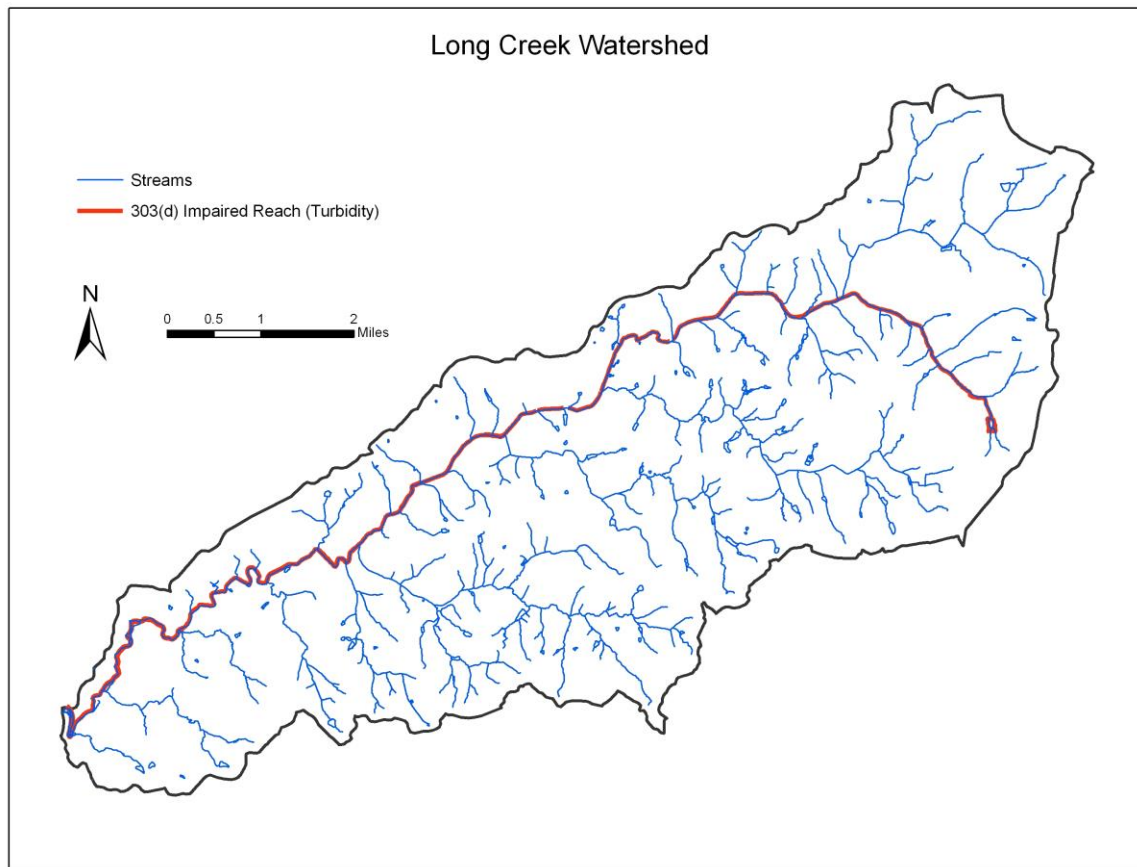


Figure 3-2: Long Creek Watershed



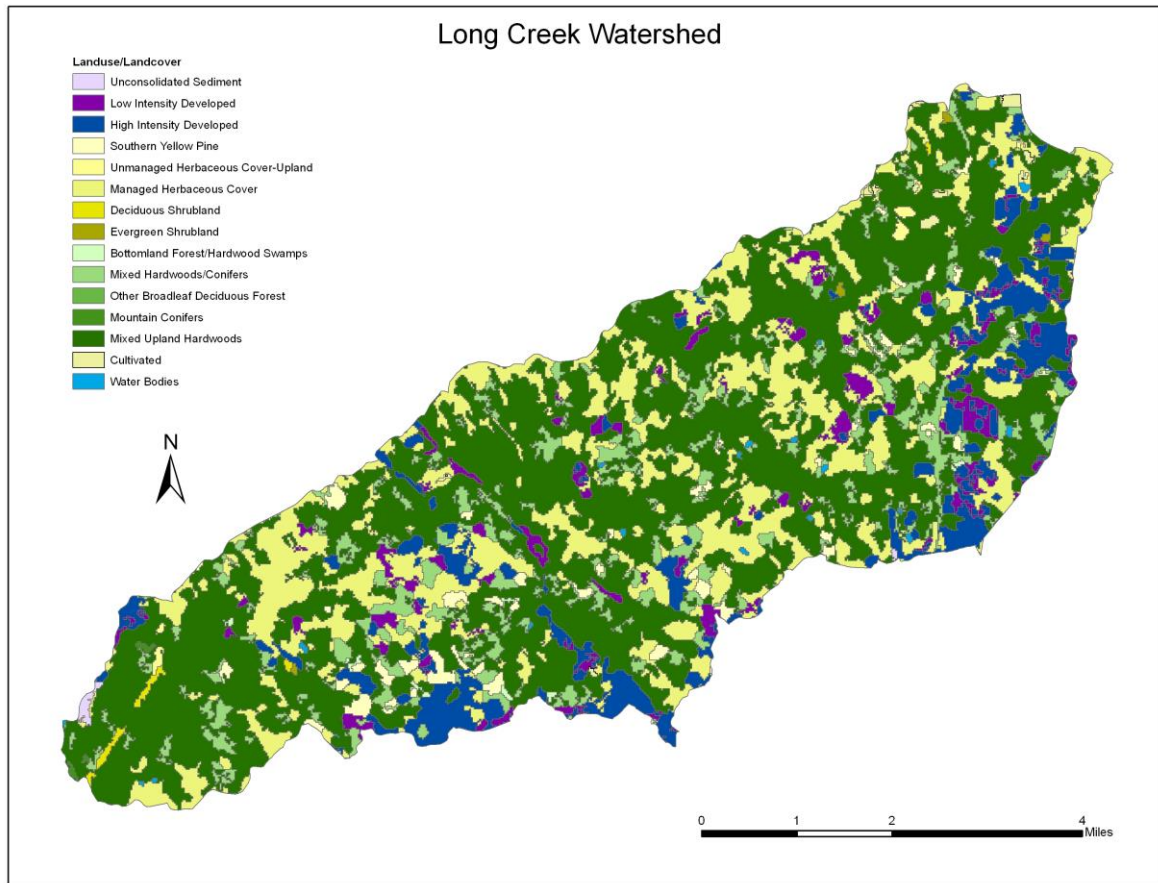


Figure 3-3: Long Creek Watershed Land Uses

### 3.2 McKee Creek Watershed

The McKee Creek watershed is located within Mecklenburg and Cabarrus Counties, in the eastern part of the Greater Charlotte Metropolitan Area, North Carolina and the Yadkin River Basin. Of the total 5,516 acres in the McKee watershed, 4,008 acres (73%) of the watershed lie within Mecklenburg County and the remaining 1,508 acres (27%) lie within Cabarrus County. The watershed is within the Hydrologic Unit Code 03040105, as designated by the U.S. Geological Survey (USGS) (DWR sub-basin 03-07-11). McKee Creek originates in Mecklenburg County and flows north-northeast to its confluence with Reedy Creek in Cabarrus County. Reedy Creek discharges to the Rocky River, which in turn discharges to the Yadkin River<sup>2</sup>. The McKee Creek drainage area is approximately 5.9 square miles with about 1.4% impervious cover. **Figures 3-4 through 3-6** below show the location of McKee Creek watershed within the Charlotte-Mecklenburg area, the McKee Creek watershed impaired reach and tributary streams, and the McKee Creek watershed land uses, respectively.

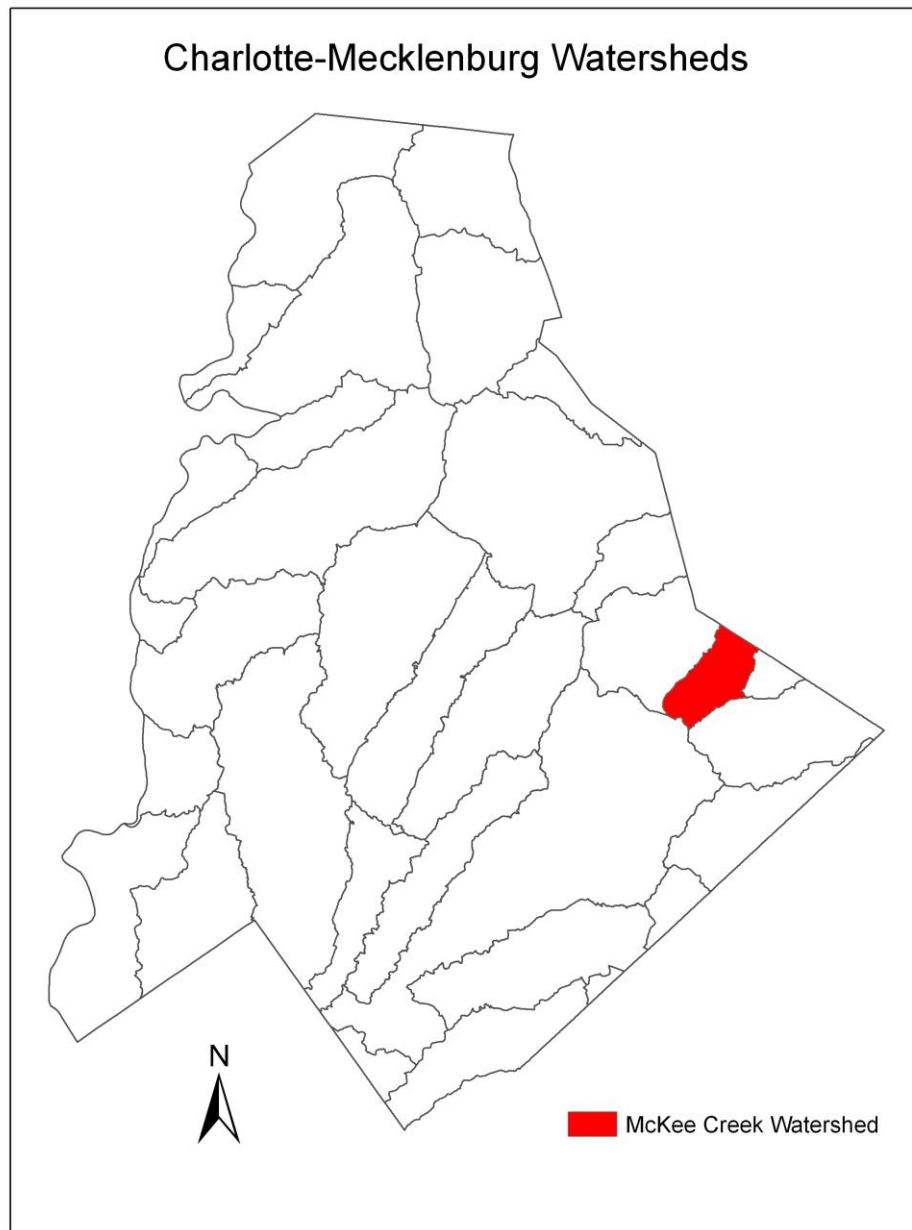
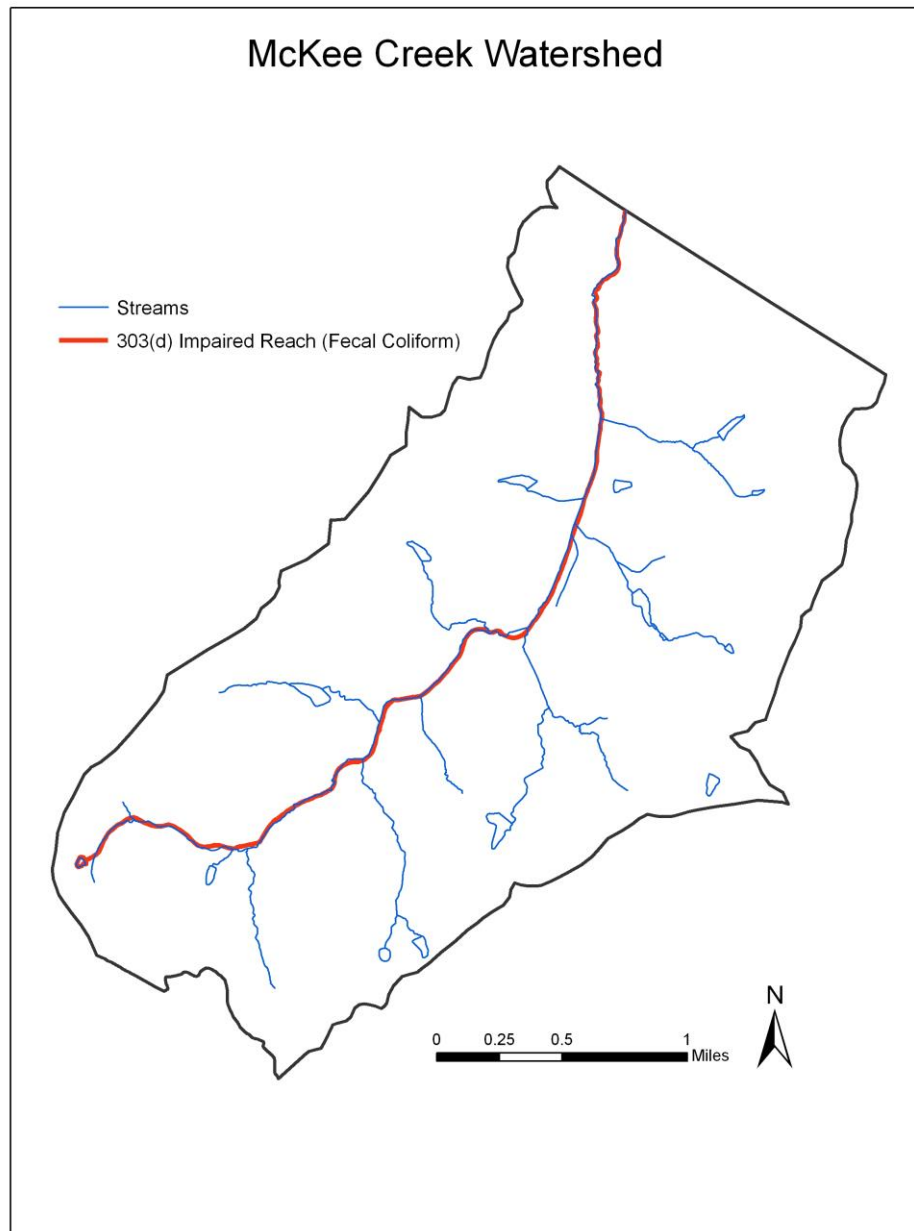


Figure 3-4: Charlotte-Mecklenburg Watersheds



**Figure 3-5: McKee Creek Watershed**

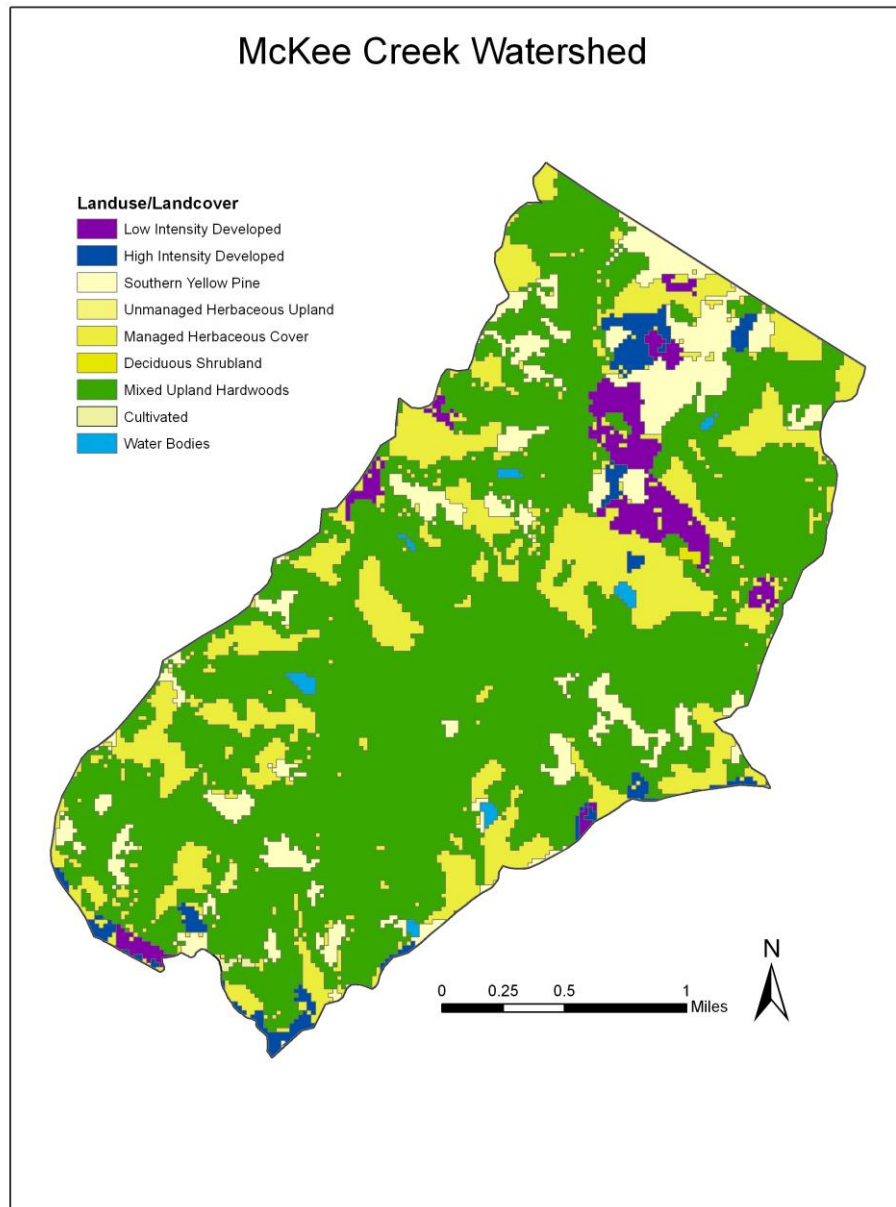


Figure 3-6: McKee Creek Watershed Land Uses

### 3.3 Steele Creek Watershed

The Steele Creek watershed originates in Mecklenburg County, NC and drains to York County, SC in the Catawba River Basin. The upper portion of the watershed within NC is 9,954 acres with about 11% impervious cover and is located in the southwestern part of the City of Charlotte and Mecklenburg County, while the lower portion is located within York County and the City of Fort Mill. **Figures 3-7 through 3-9** below show the location of Steele Creek watershed within

the Charlotte-Mecklenburg area, the Steele Creek watershed stream reach and tributary streams, and the Steele Creek watershed land uses, respectively.

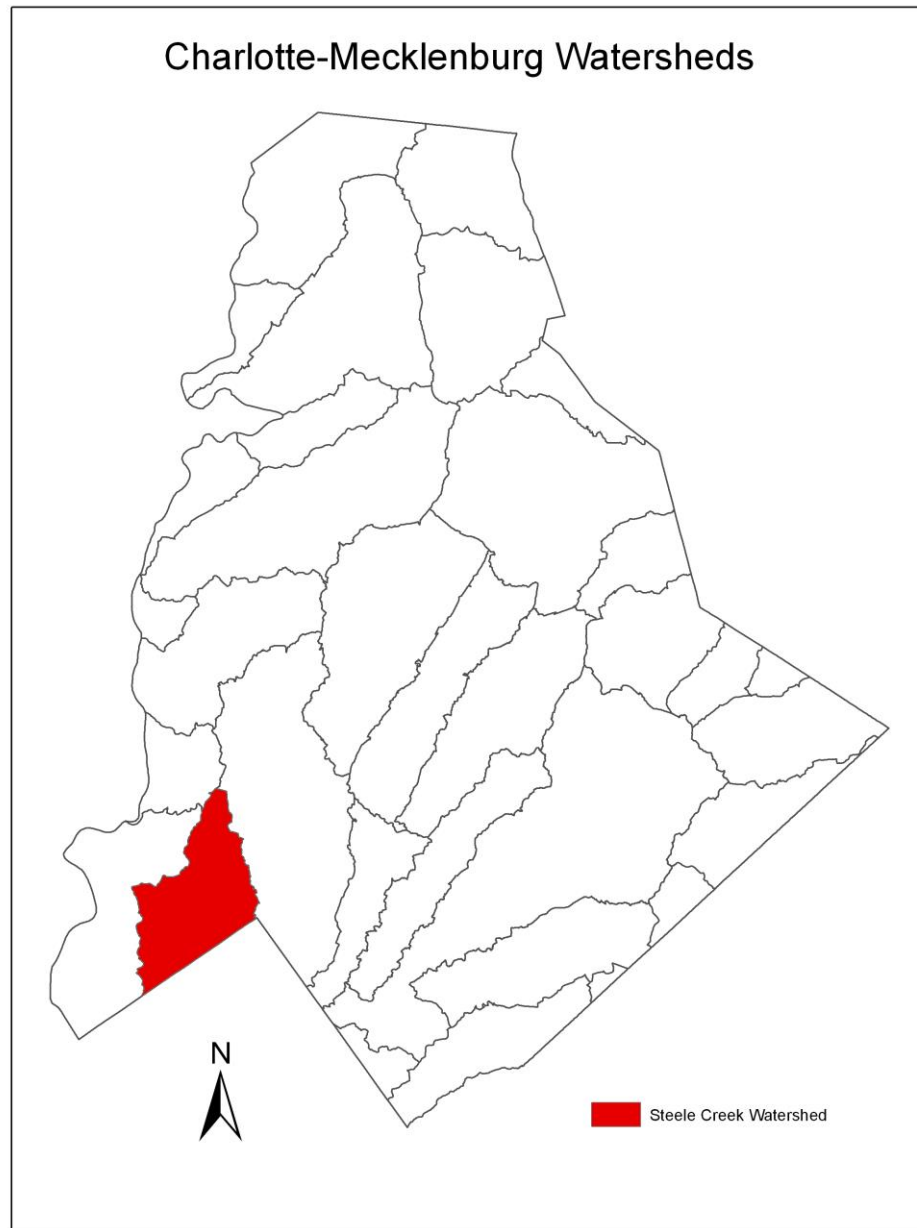


Figure 3-7: Charlotte-Mecklenburg Watersheds

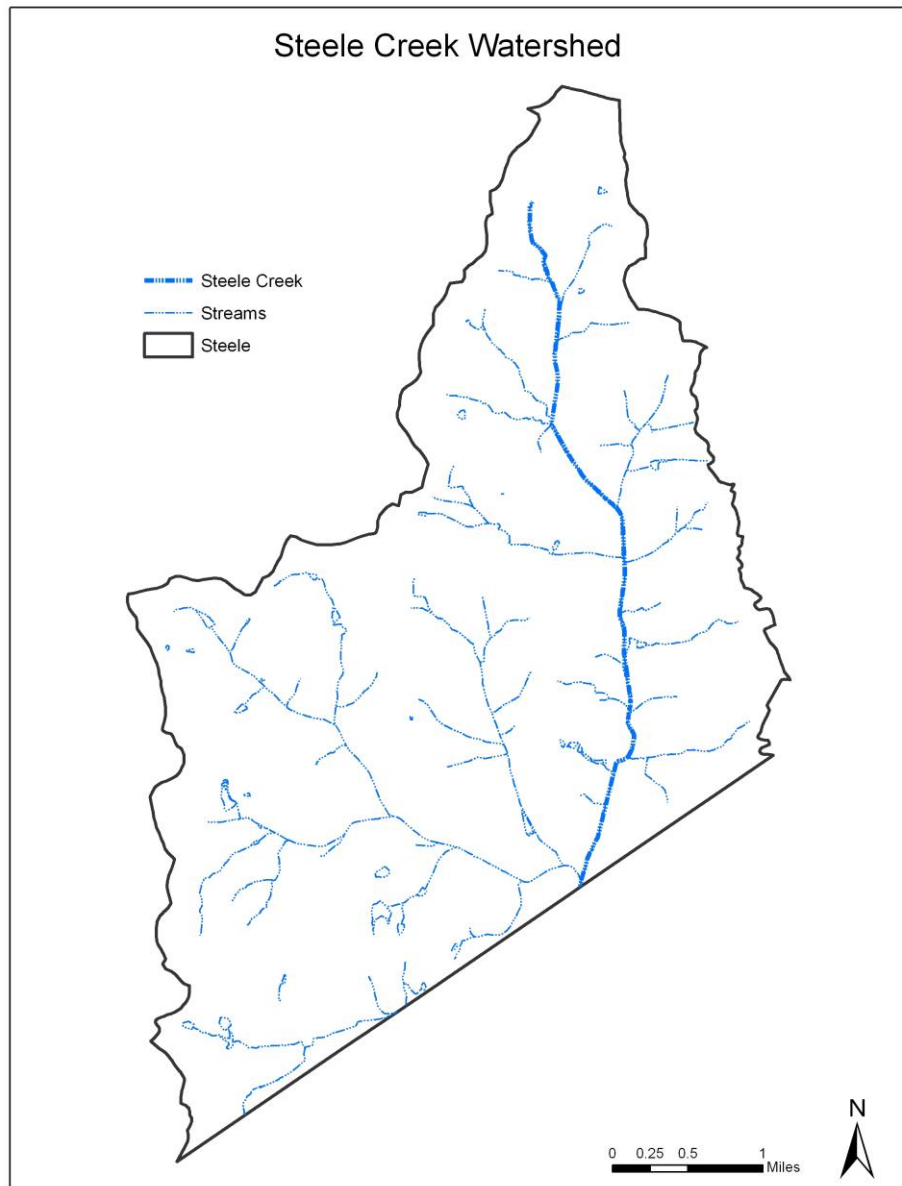


Figure 3-8: Steele Creek Watershed



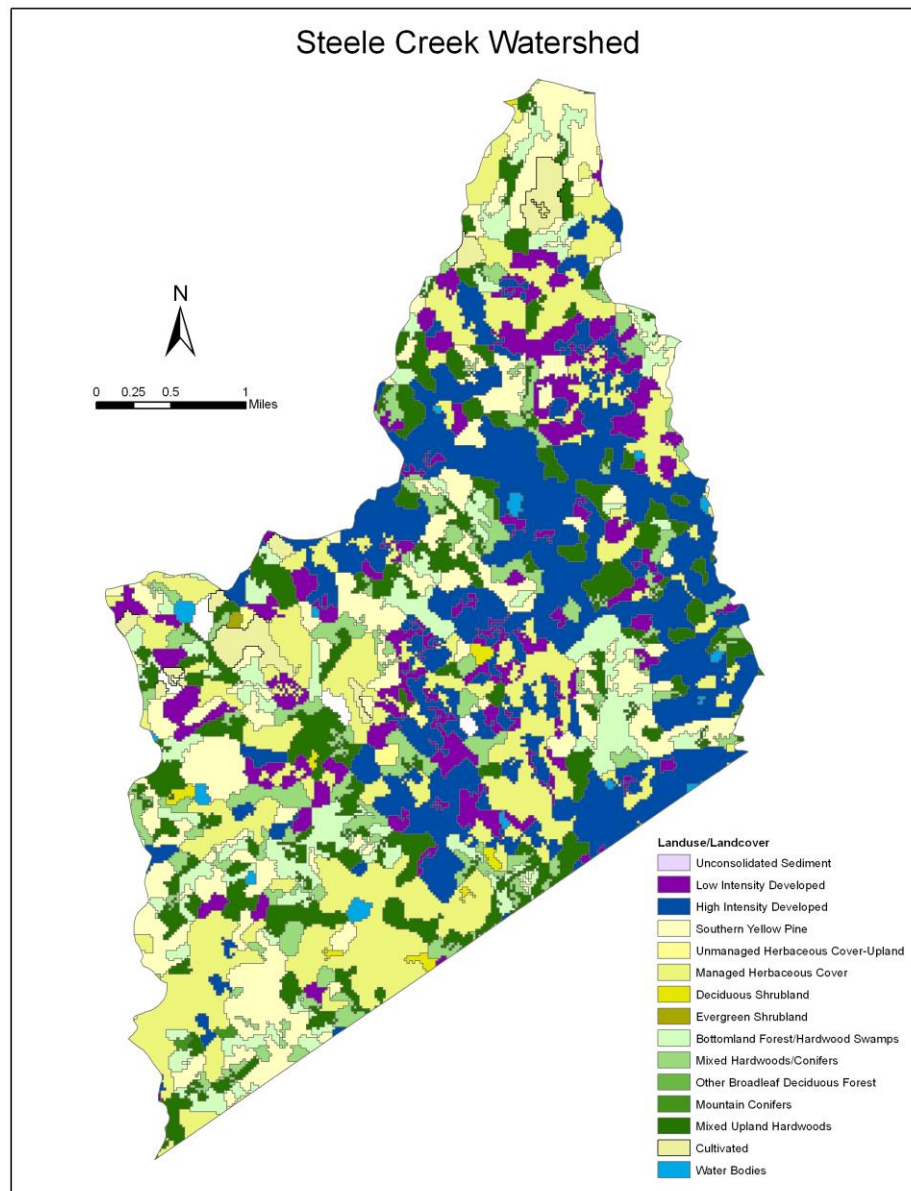


Figure 3-9: Steele Creek Watershed Land Uses

### 3.4 Sugar/Irwin Creek Watershed

Sugar Creek originates in Mecklenburg County, NC and drains to York County, SC in the Catawba River Basin. **Figures 3-10 through 3-12** below show the location of Sugar Creek watershed within the Charlotte-Mecklenburg area, the Sugar Creek watershed stream reach and tributary streams, and the Sugar Creek watershed land uses, respectively. The upper portion of the watershed in **Figure 3-11** is Irwin Creek which drains to Sugar Creek. Irwin and Sugar Creeks are located in the DWR 12-digit sub-watershed 030501030103. The Irwin Creek

drainage area is approximately 30 square miles and is about 16% impervious while the Sugar Creek drainage area is about 37.5 square miles with about 18% impervious cover.

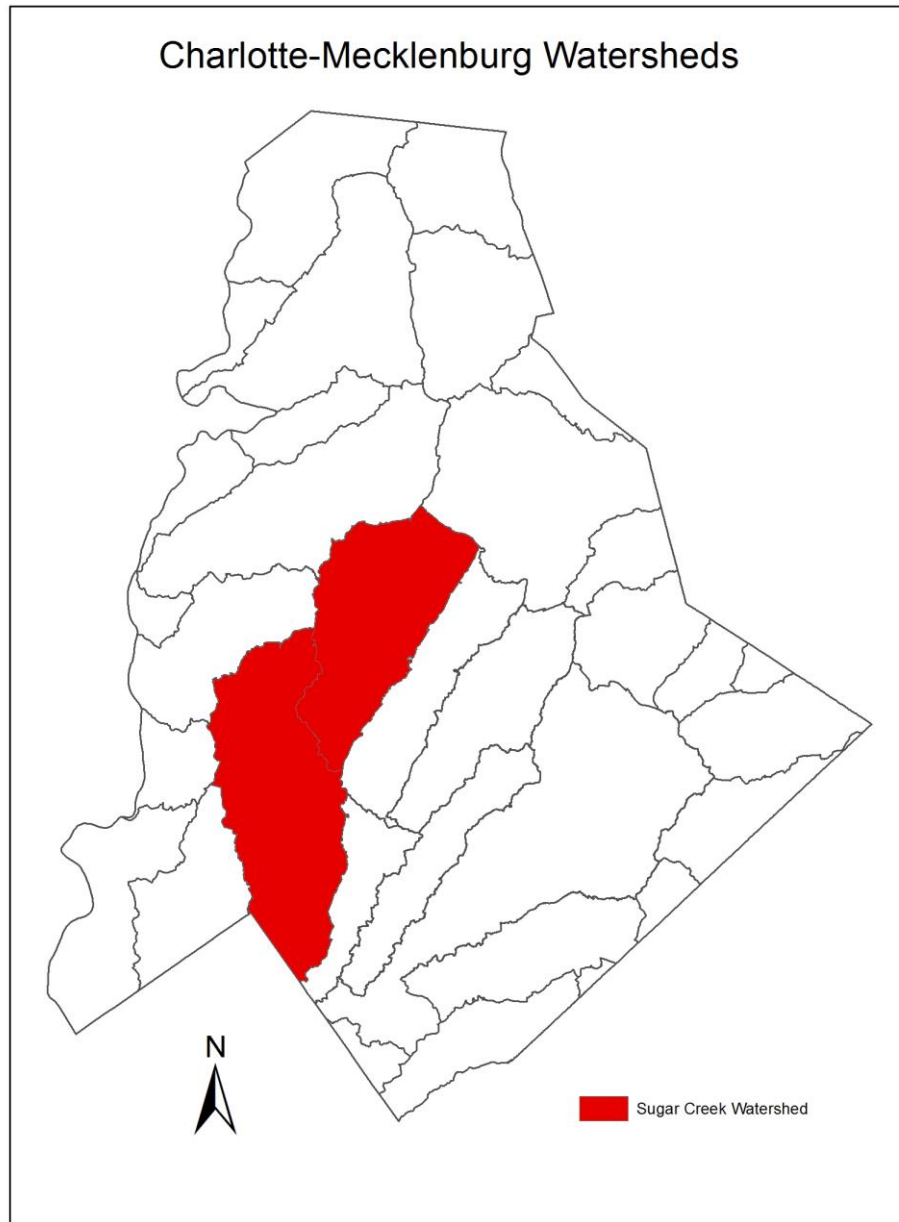


Figure 3-10: Charlotte-Mecklenburg Watersheds

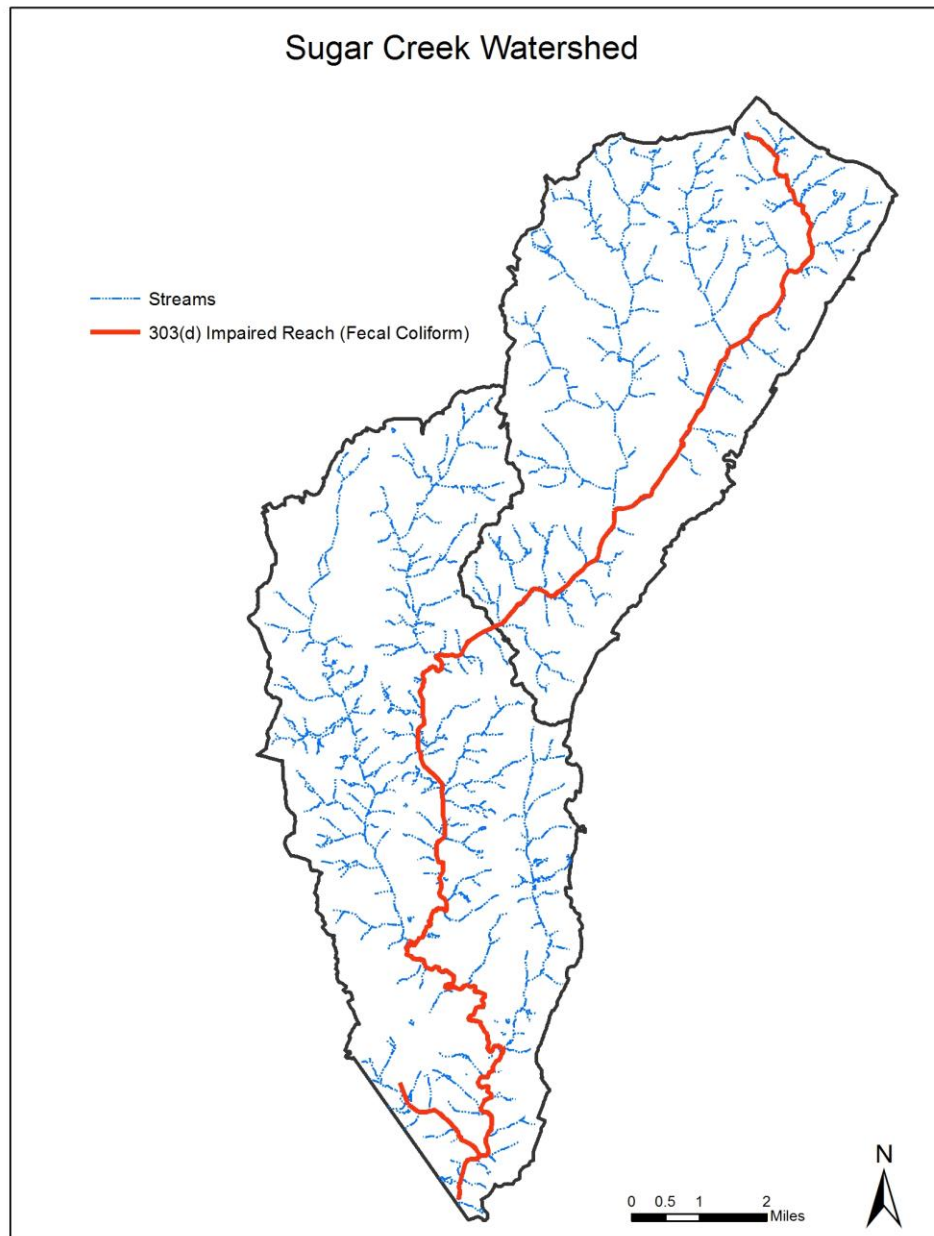


Figure 3-11: Sugar Creek Watershed

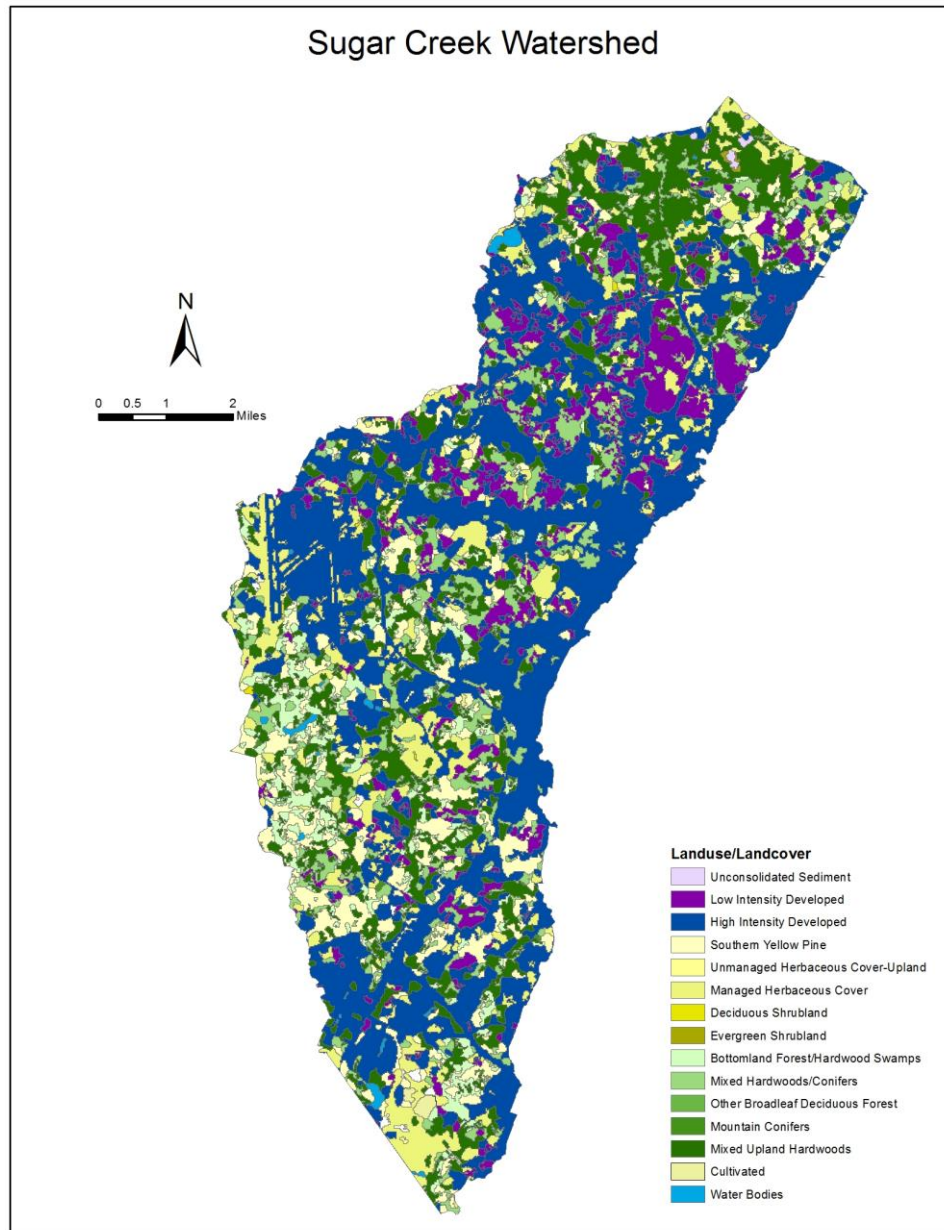


Figure 3-12: Sugar Creek Watershed Land Uses

### 3.5 Little Sugar Creek Watershed

Little Sugar Creek originates in Mecklenburg County, NC and drains to York County, SC in the Catawba River Basin. **Figures 3-13 through 3-15** below show the location of the Little Sugar Creek watershed within the Charlotte-Mecklenburg area, the Little Sugar Creek watershed stream reach and tributary streams, and the Little Sugar Creek watershed land uses, respectively. The two upper sub-watersheds depicted in **Figure 3-14** represent Upper Little Sugar Creek to the left and Briar Creek to the right, both of which drain to Lower Little Sugar Creek. The Upper

Little Sugar Creek drainage area is approximately 19.3 square miles and 21.5% impervious, Briar Creek is about 21.6 square miles and 13.6% impervious, and Lower Little Sugar Creek is about 10.1 square miles and 20% impervious. Little Sugar Creek is located in the DWR 12-digit sub-watershed 030501030102.

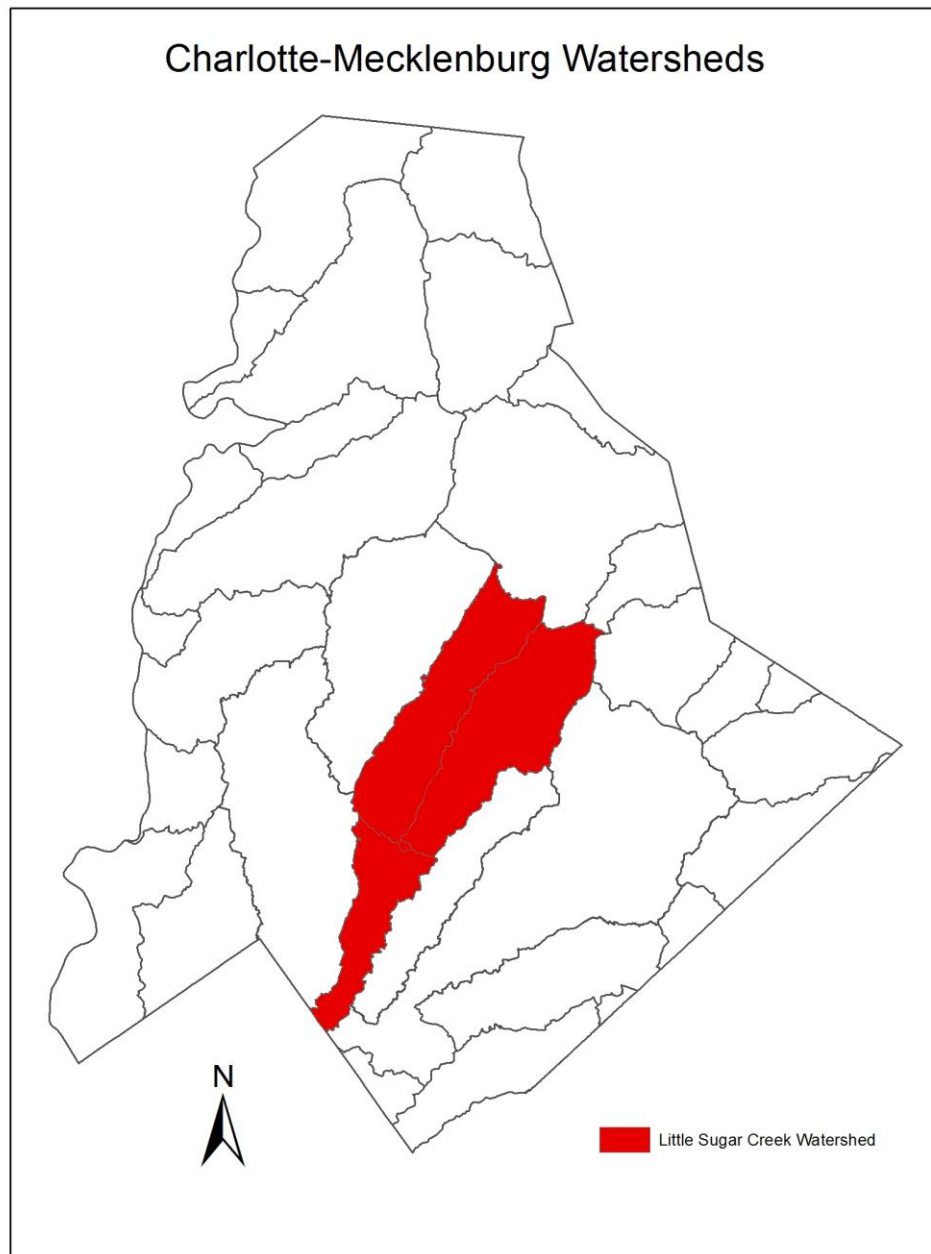


Figure 3-13: Charlotte-Mecklenburg Watersheds

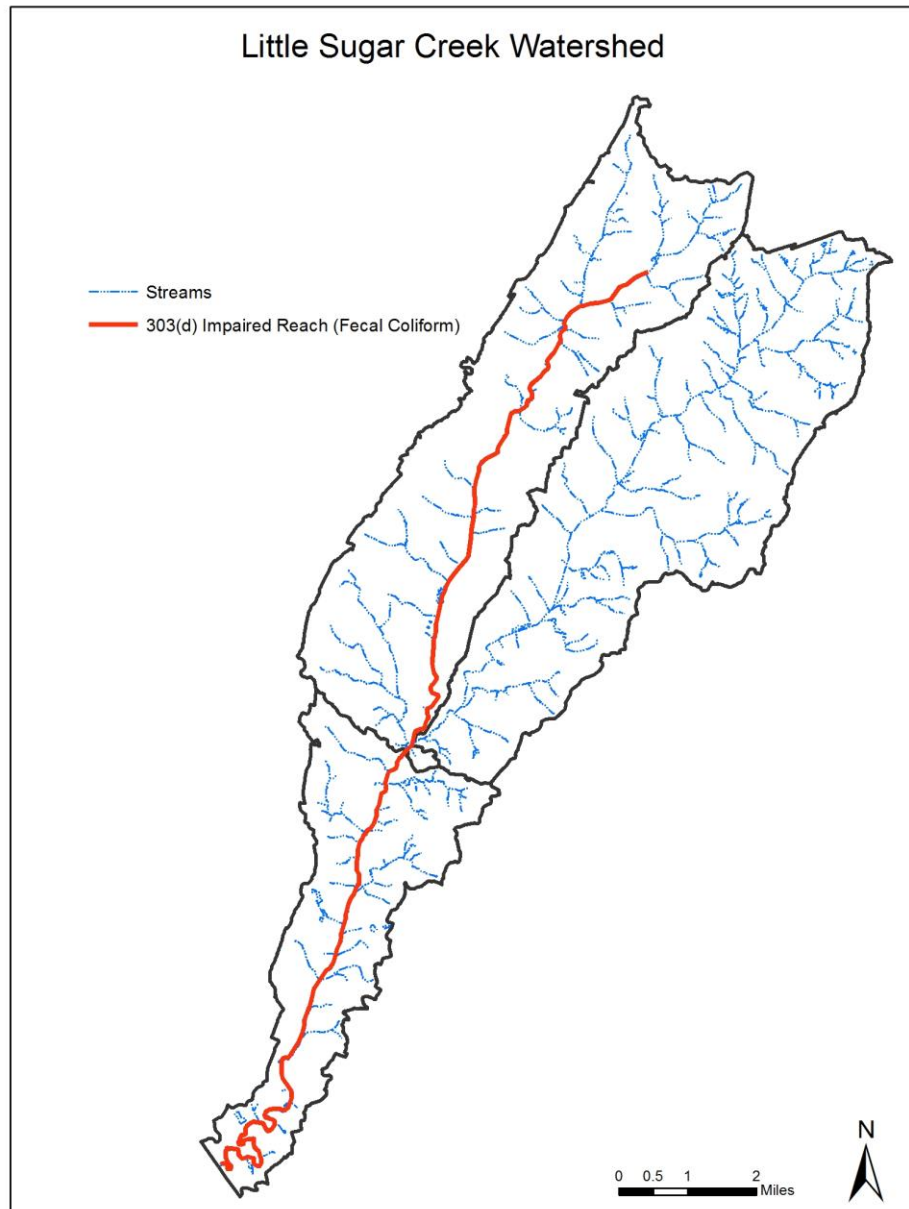


Figure 3-14: Little Sugar Creek Watershed



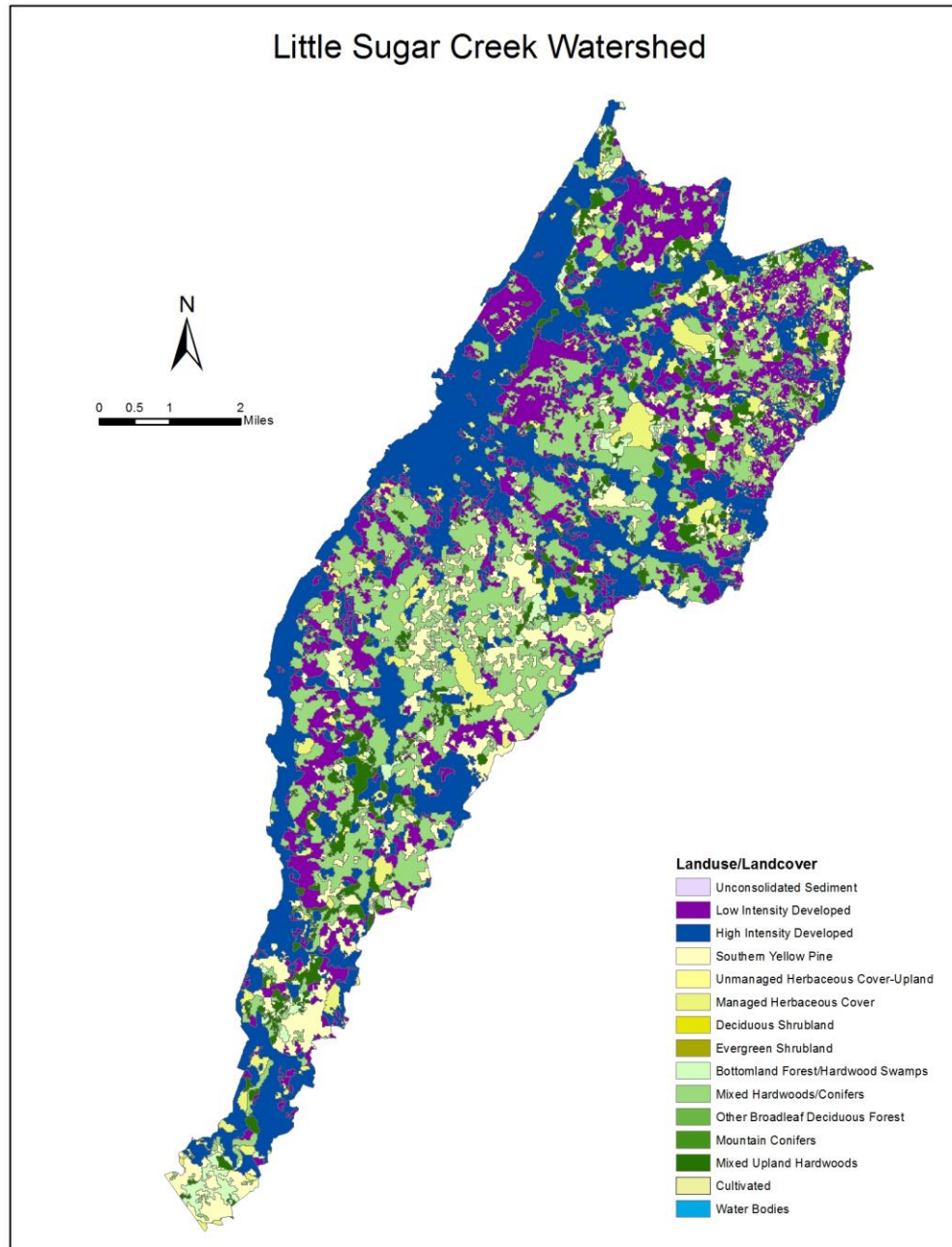


Figure 3-15: Little Sugar Creek Watershed Land Uses

### 3.6 McAlpine Creek Watershed

McAlpine Creek originates in Mecklenburg County, NC and drains to York County, SC in the Catawba River Basin. **Figures 3-16 through 3-18** below show the location of McAlpine Creek watershed within the Charlotte-Mecklenburg area, the McAlpine Creek watershed stream reach and tributary streams, and the McAlpine Creek watershed land uses, respectively. In **Figure 3-17**, McAlpine Creek is depicted in red due to its 303(d) impairment. McMullen Creek and Four

Mile Creek drain to McAlpine Creek. The McAlpine Creek drainage area is about 59.2 square miles and 9.2% impervious, McMullen Creek is about 15.2 square miles and 13% impervious, and Four Mile Creek is about 18.6 square miles and 5.5% impervious. McAlpine Creek is located in the DWR 12-digit sub-watershed 030501030104.

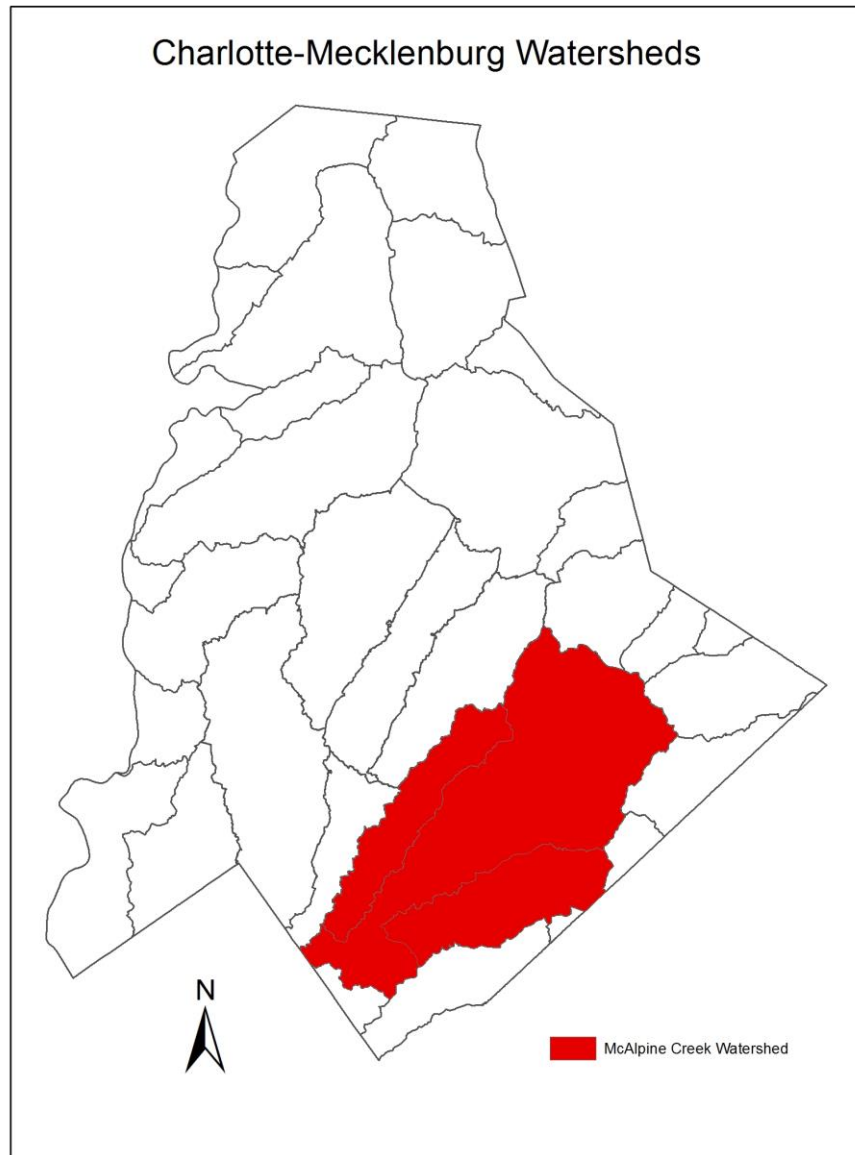


Figure 3-16: Charlotte-Mecklenburg Watersheds

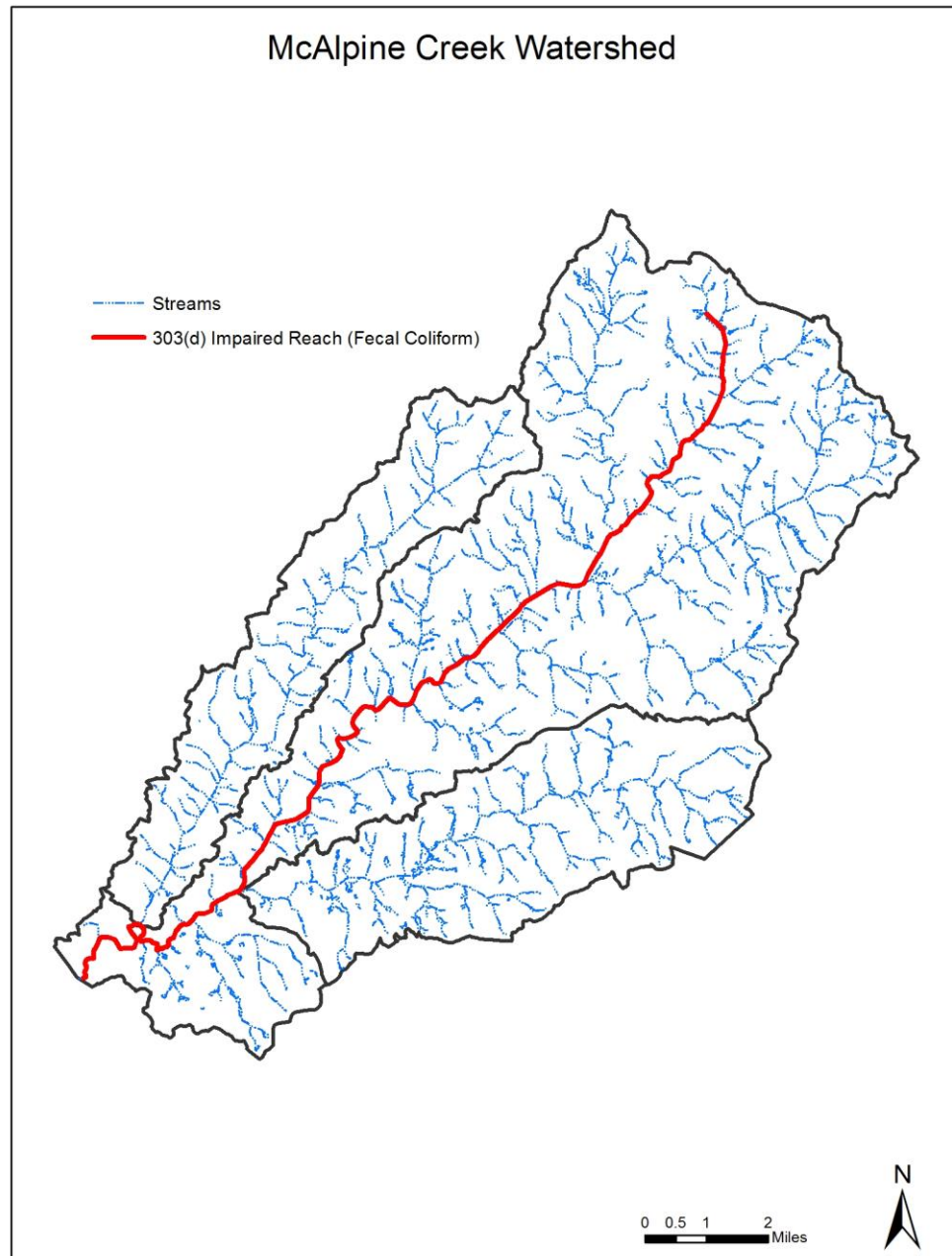


Figure 3-17: McAlpine Creek Watershed

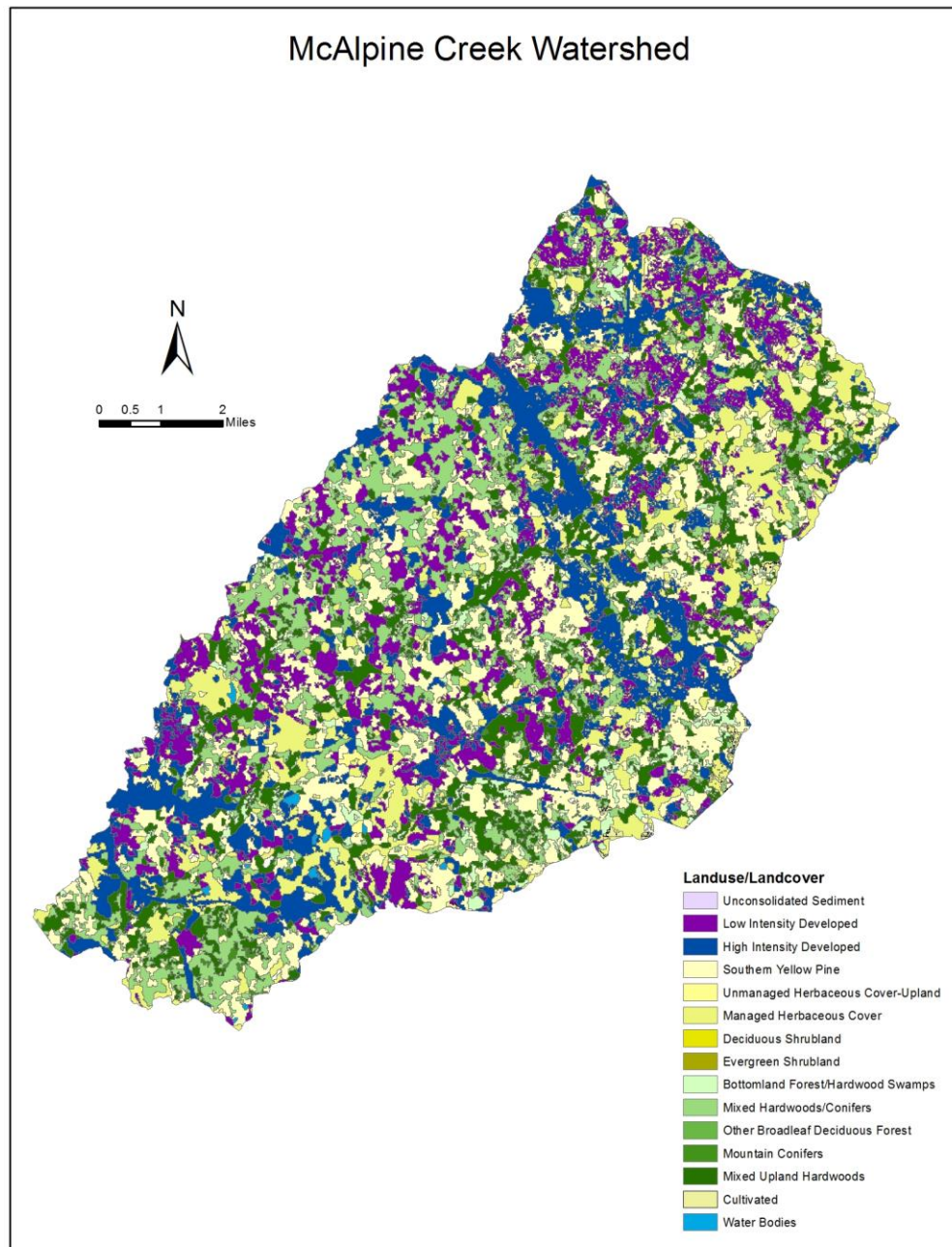


Figure 3-18: McAlpine Creek Watershed Land Uses

#### **Section 4: Public Information and Notification**

The Public Information and Notification component of the TMDL watershed plan is designed to provide citizens and businesses with access to information about TMDLs that affect the City of Charlotte and Mecklenburg County and the methods that will be used to reduce the TMDL pollutants. The public will be notified about the TMDLs and the TMDL watershed plan as follows:

- The Charlotte-Mecklenburg Storm Water Services (CMSWS) website will contain information about the city and county's TMDLs, the TMDL pollutants of concern, the TMDL watershed plan, and how the public can report water pollution problems and become engaged in volunteer opportunities.
- The City's NPDES MS4 annual report will also be posted on the CMSWS website and will provide a summary of the activities conducted under the TMDL watershed plan.

#### **Section 5: Implementation Team**

A team of staff representatives from the City and County will serve as the primary implementation team for the TMDL Watershed Plan. Other staff members from affected municipal agencies that conduct activities within the TMDL watershed will also be included as necessary. The following City of Charlotte and Mecklenburg County staff positions were identified as key members of the TMDL Watershed Plan Implementation Team:

- City Water Quality Program Manager
- City Water Quality NPDES Supervisor
- City Water Quality NPDES Administrator
- City Land Development Erosion Control Administrator
- City Water Quality Public Information Specialist
- City Water Quality Modeler
- City Water Quality Planner
- City Water Quality Senior Specialist
- City Water Quality Post-Construction Administrator
- City Storm Water MS4 Inventory Supervisor
- City Utility Department Sanitary Sewer System Administrator
- County Water Quality Program Manager
- County Water Quality Supervisor
- County Water Quality Project Manager
- County Water Quality Public Information Specialist

The City's Engineering & Property Management Department-Storm Water Division will have primary responsibility for coordinating the efforts and activities of the TMDL Watershed Plan Implementation Team. This will include interpreting data, evaluating BMP effectiveness, reporting to NCDEQ-Division of Energy, Mining, and Land Resources (DEMLR), and



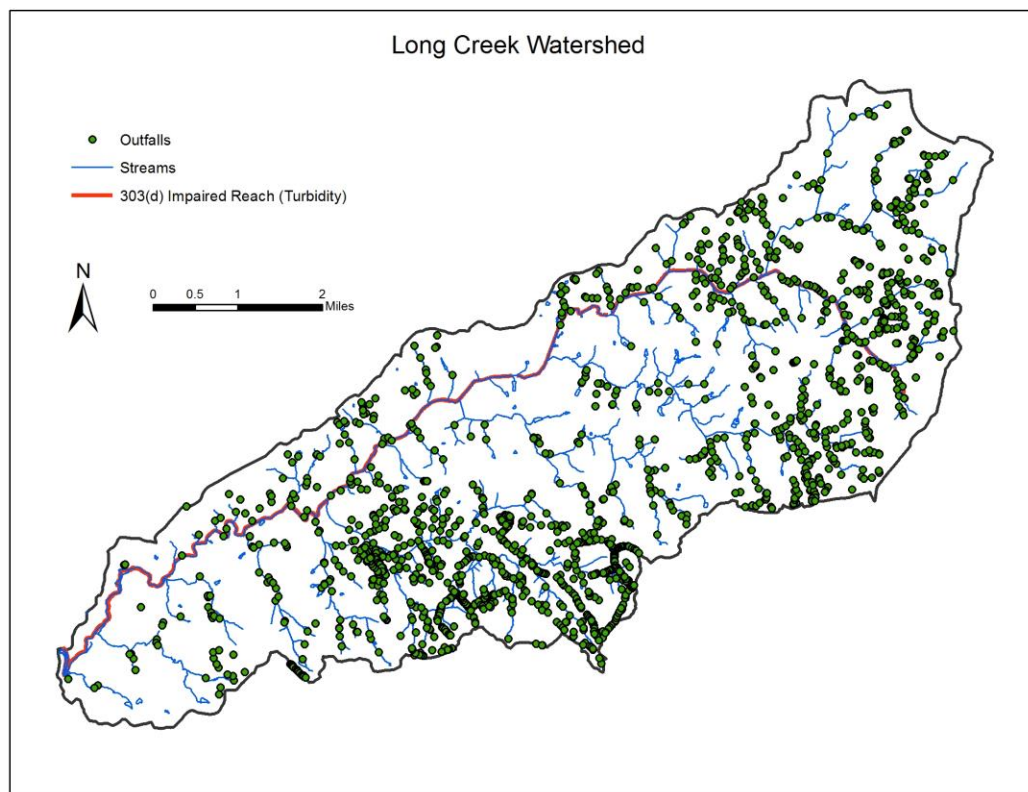
coordinating other activities and reviews with the overall Implementation Team to meet the components and goals of the TMDL Watershed Plan.

## **Section 6: MS4 Major Outfall Identification**

The major stormwater outfalls in Long Creek, McKee Creek, Steele Creek, Sugar Creek, Little Sugar, and McAlpine Creek have been identified through MS4 inventory collection activities and are illustrated in **Figures 6-1 through 6-6**, respectively. The number of outfalls in each watershed is shown in **Table 6-1**. The schedule to discover additional major outfalls for this plan will be the same schedule as noted in the City’s stormwater management plan for outfall inventory collection.

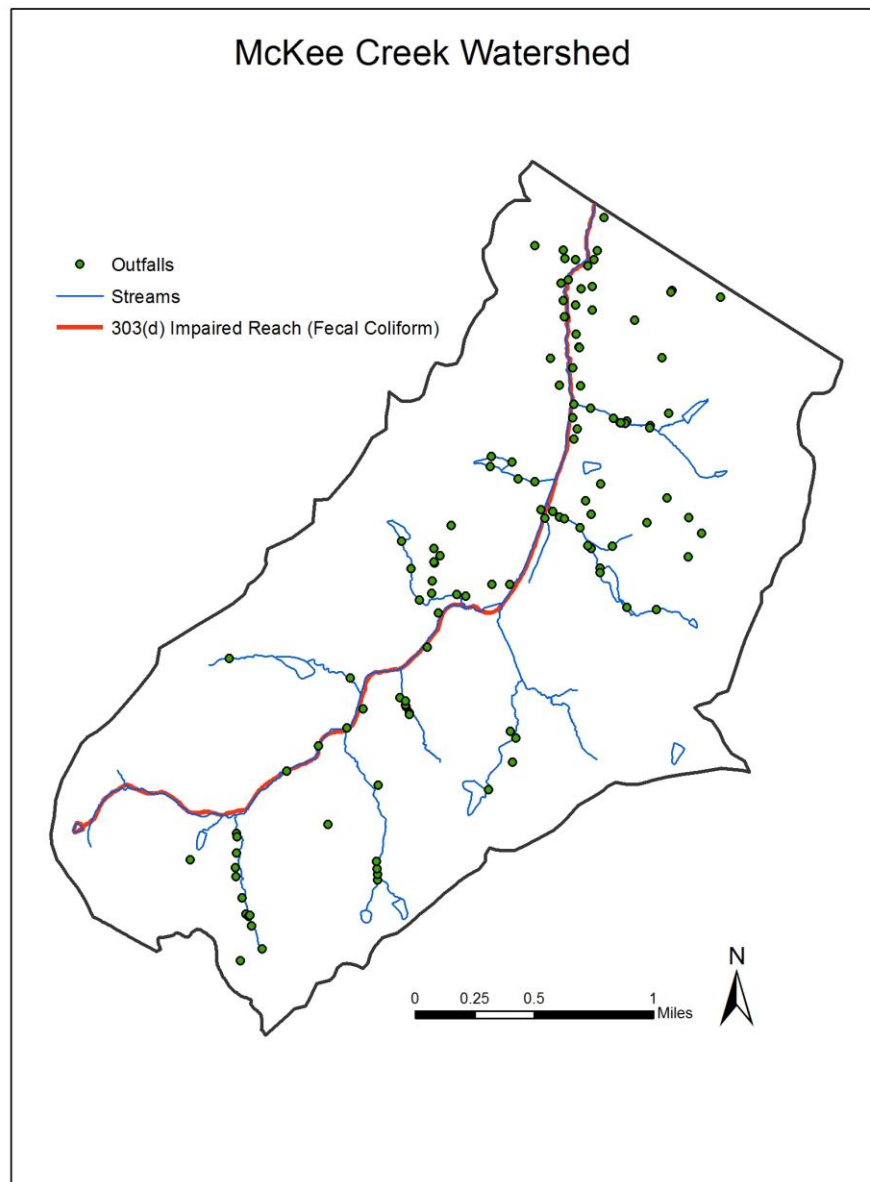
**Table 6-1:** Number of outfalls in each TMDL watershed

<b>Watershed</b>	<b>Number of outfalls</b>
Little Sugar Creek	4,886
Long Creek	1,635
McAlpine Creek	6,664
McKee Creek	120
Steele Creek	756
Sugar Creek	3,538



**Figure 6-1: Long Creek Watershed Major Outfalls**





**Figure 6-2: McKee Creek Watershed Major Outfalls**

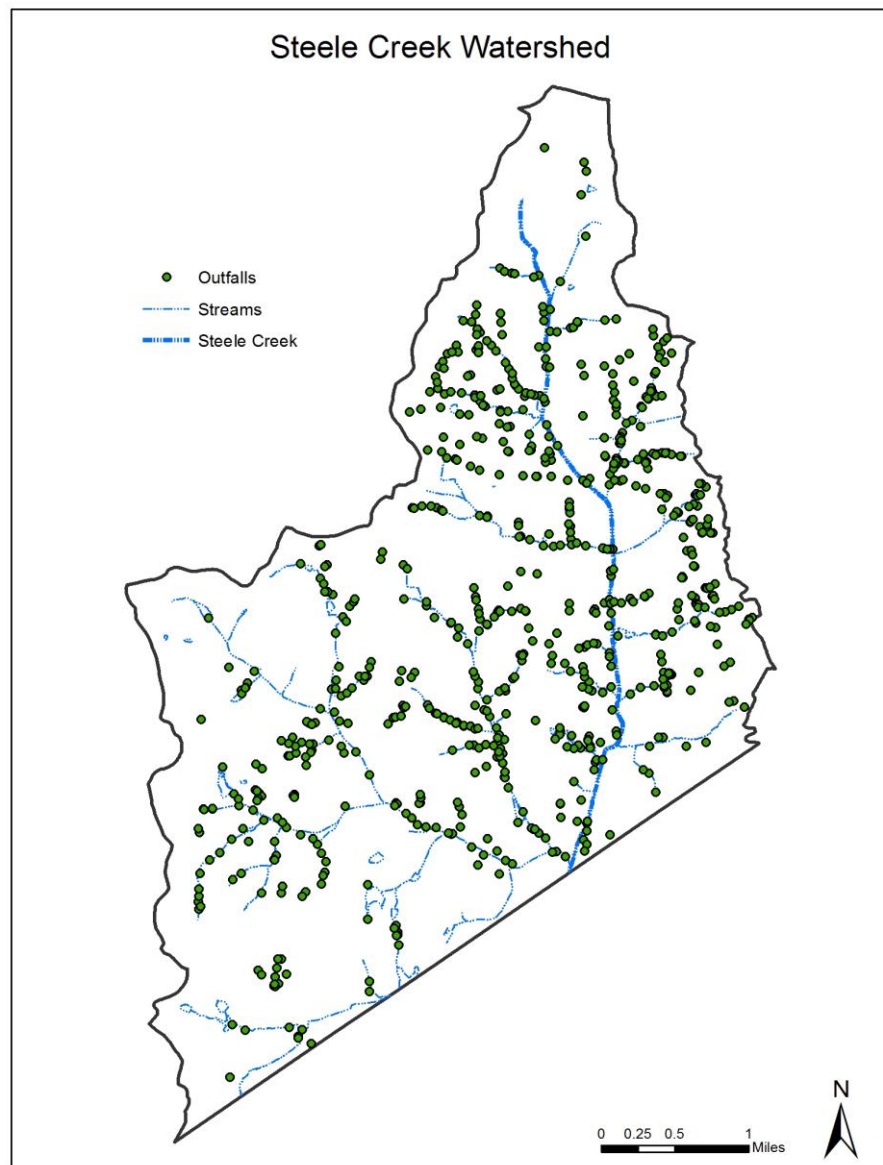


Figure 6-3: Steele Creek Watershed Major Outfalls

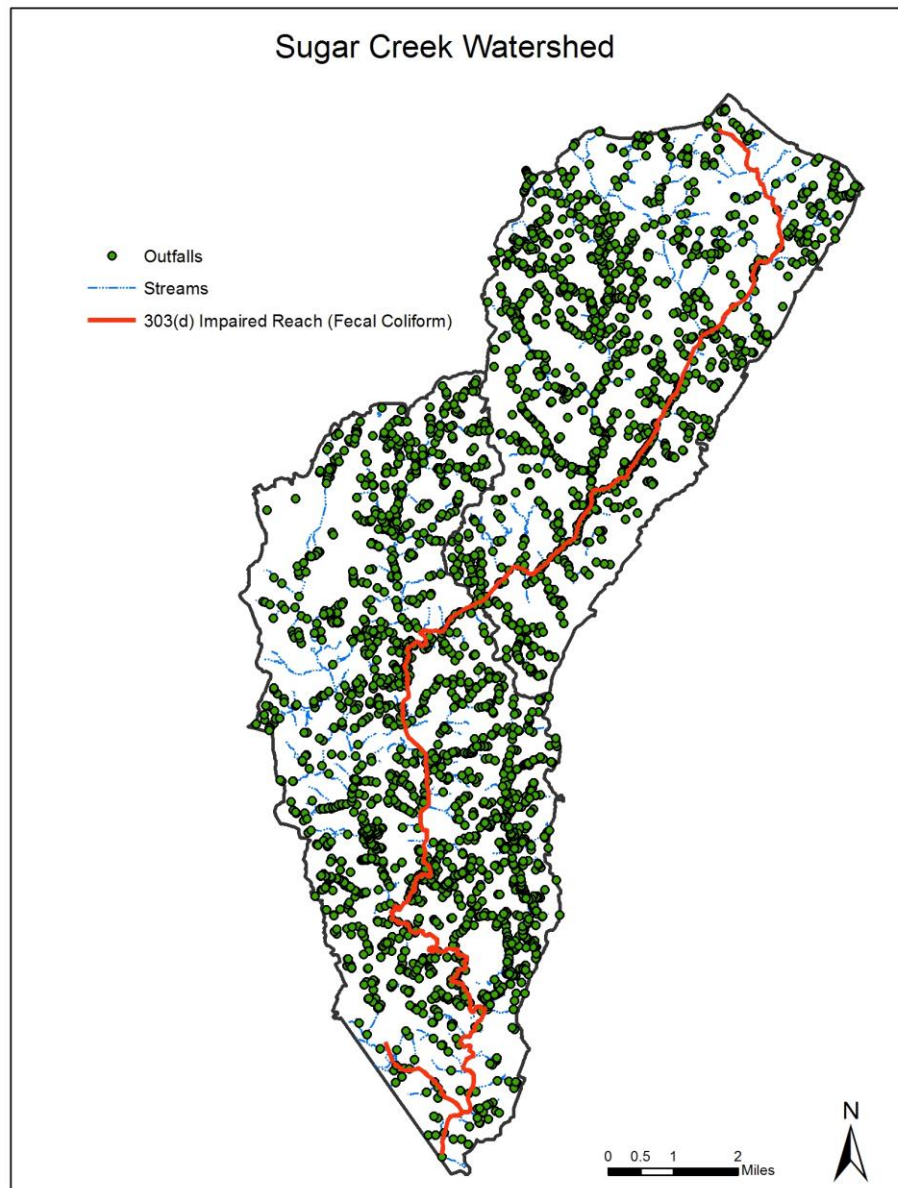


Figure 6-4: Sugar Creek Watershed Major Outfalls

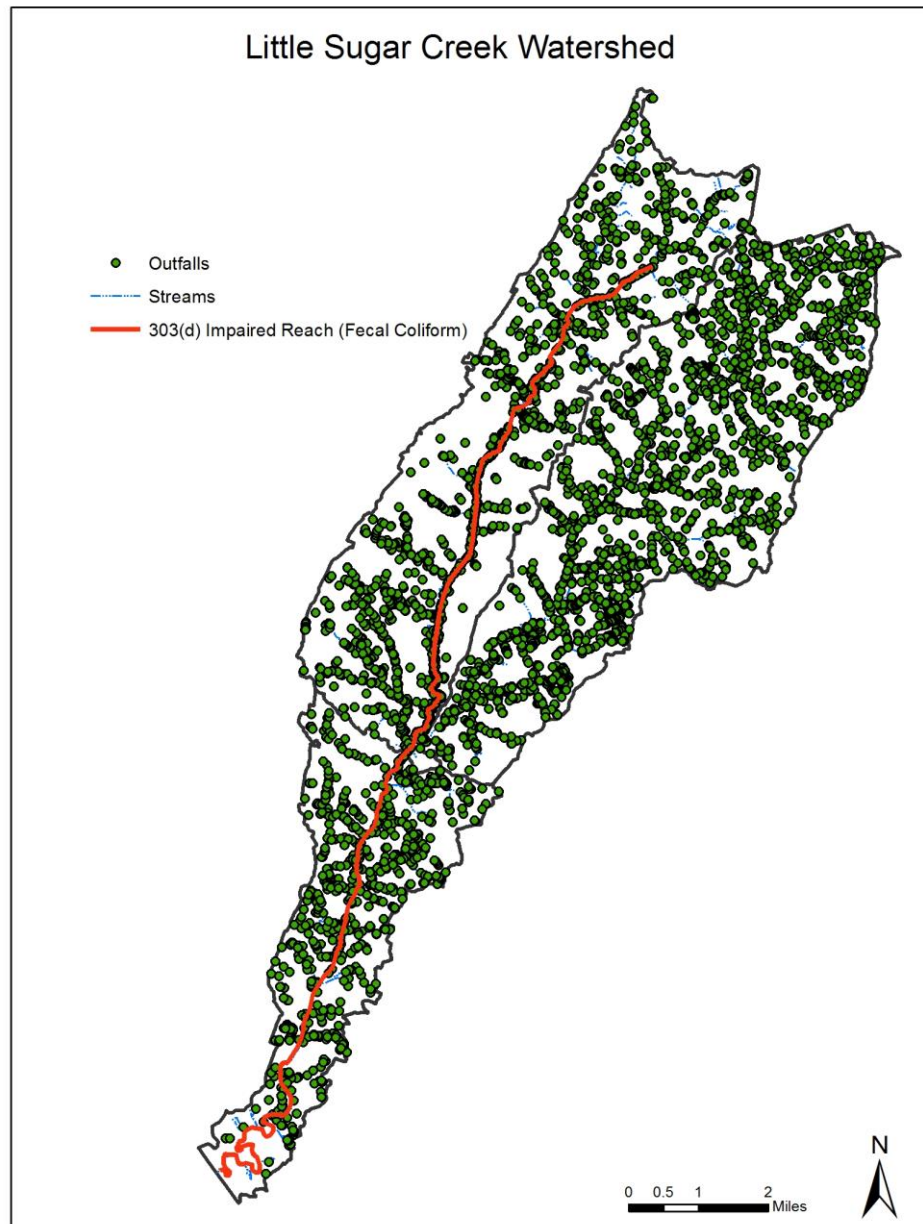


Figure 6-5: Little Sugar Creek Watershed Major Outfalls

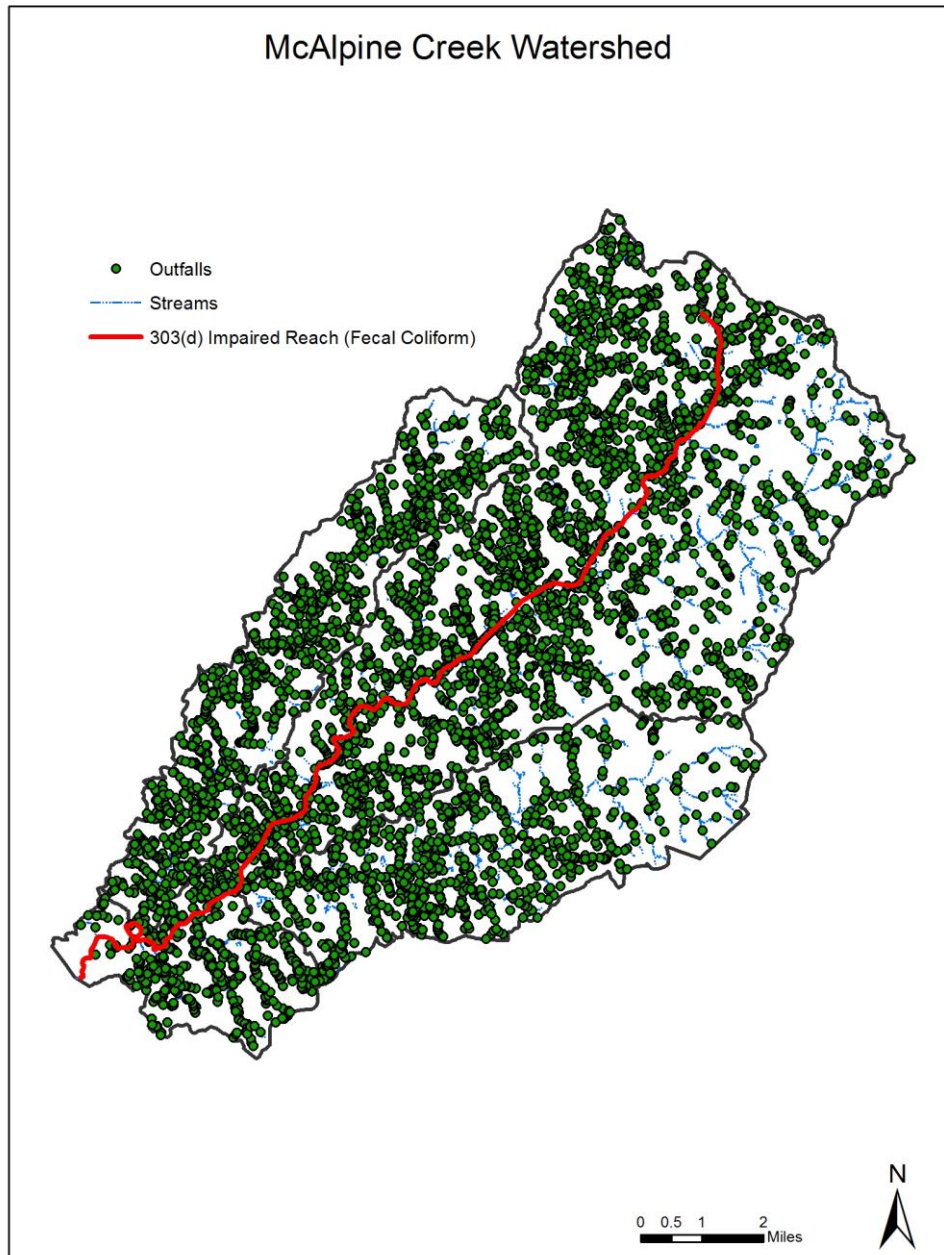


Figure 6-6: McAlpine Creek Watershed Major Outfalls

## **Section 7: Existing BMP Measures**

As discussed in Section 2, the primary TMDL pollutants of concern within Charlotte-Mecklenburg watersheds are fecal coliform, sediment, mercury, and nutrients (nitrogen and phosphorus). These primary pollutants have likely contributed to various water quality standards excursions over time for fecal coliform, turbidity, mercury, dissolved oxygen, and chlorophyll-a,

which have resulted in section 303(d) stream impairment listings and subsequent TMDL development for these parameters.

As part of developing this TMDL Watershed Plan, existing measures currently implemented within the City and County NPDES permit programs were reviewed to determine which would best address the TMDL pollutants of concern. It was determined the following existing measures, discussed below, are designed to achieve the MS4 NPDES WLA to reduce the TMDL pollutants of concern to the maximum extent practicable (MEP). For more detailed information on these measures, please see the City and County NPDES MS4 Stormwater Management Plans.

## 7.1 Public Education & Outreach

### 7.1.1 *Utility Bill Inserts, Environmental Notices, and Brochures*

Print materials are distributed to the public through a variety of events and programs and help educate them about water quality issues, the TMDL pollutants of concern, and the ways they can help reduce these pollution sources.

### 7.1.2 *Media Campaign*

The CMSWS media campaign uses television, radio, and print media to communicate water quality and pollution prevention messages, including those related to the TMDL pollutants of concern.

### 7.1.3 *Pet Waste Education*

Information about the importance of cleaning up pet waste is a standard part of the CMSWS education campaign. The slogan, “Scoop the Poop” has been used for several years to encourage pet owners to clean up their pet waste to help reduce fecal coliform pollution in stormwater runoff. Pet waste bag dispensers and waste receptacles are provided within several parks and along greenway trails.

### 7.1.4 *Informational Website*

The CMSWS website provides information on a variety of stormwater and water quality issues and programs, including pollution prevention, public reporting of problems, and volunteer opportunities.

### 7.1.5 *Social Media*

CMSWS currently maintains Twitter and Facebook accounts to promote water quality messages and encourage the public to report pollution problems.



#### 7.1.6 *Public Hotline/Helpline*

The City of Charlotte and Mecklenburg County operate a joint customer service hotline to receive information from citizens about a variety of concerns. Citizens can dial 311 any time of the day to report pollution, erosion issues, flooding, and blockages to the drainage system as well as request other City/County services. Problems and pollution issues reported through this system are addressed by appropriate City or County personnel.

#### 7.1.7 *CMCSI Program*

The City and County maintain the *Charlotte-Mecklenburg Certified Site Inspector (CMCSI)* training program which has provided training to over five thousand (5,000) attendees since its inception in 2003. CMCSI is a full day training course that provides attendees with an understanding of the importance of water resources to our community, the local and state requirements for controlling construction site runoff, principles of erosion control, common site problems, recommendations for conducting effective inspections, and a certification exam. Site inspectors are required to be recertified under the CMCSI program every two years.

#### 7.1.8 *Public Events and Presentations*

CMSWS participates in several public events and provides a wide variety of presentations to promote and communicate water quality and pollution prevention messages to the public each year.

#### 7.1.9 *Fats, Oils, and Grease Program*

The City's utility department maintains a public education program focused on keeping food related fats, oils, and grease from being discharged to the sanitary sewer system. This effort helps to reduce clogging and blockages in the system and prevent SSOs, which can introduce fecal coliform and other pollutants to water bodies.

### 7.2 Public Involvement and Participation

#### 7.2.1 *Storm Drain Marking*

The Storm Drain Marking program provides citizens with a volunteer opportunity to assist in protecting water quality. Volunteers affix a vinyl marker to storm drains providing the message "Do not dump, drains to creek". This message is intended to educate citizens about the "street to stream" path of stormwater and prevent illegal dumping.

#### 7.2.2 *Adopt-A-Stream and Big Sweep*

The Adopt-A-Stream program provides citizens with the resources needed to adopt a section of stream. Volunteers remove trash from the stream and stream banks and visually inspect the stream for signs of pollution once or twice per year and they are provided garbage bags, gloves

and trash grabbers and signs with the name of their group. Volunteers can also participate in Big Sweep which is a once-a-year event where CMSWS organizes volunteers across the county to clean streams on a coordinated day.

#### *7.2.3 Volunteer Monitoring*

The Volunteer Monitoring program provides interested citizens with the opportunity to help monitor water quality. Volunteers are provided test kits for collecting physical water quality data and the means to report this information back to CMSWS. Potential problems detected by this program are referred to City/County staff for follow-up.

#### *7.2.4 Creek ReLeaf*

The Creek ReLeaf volunteer program is a Mecklenburg County initiative that provides citizens with the opportunity to help plant trees in watershed buffer areas to help stabilize soils and prevent erosion.

#### *7.2.5 Adopt-A-Street*

The City maintains an Adopt-A-Street program where citizens can volunteer to adopt a section of roadway to remove trash and litter. This effort helps to keep trash from entering the storm drain system and streams.

### *7.3 Illicit Discharge Detection and Elimination (IDDE)*

#### *7.3.1 Stream-walk Program/Outfall Inspection/Dry Weather Flow Monitoring*

County staff walks each segment of stream on a five year rotational basis to look for pollution problems, illegal dumping, illicit discharges, and SSOs. Watersheds with historically higher incidences of the above-mentioned issues are walked every other year. As part of this effort, MS4 outfalls are inspected for dry weather flows, as well.

#### *7.3.2 Multi-Family Residential Complex Initiative*

This effort focuses on multi-family residential complexes and their sanitary sewer lateral connections. City/County staff coordinate with management firms for these complexes to ensure that private sewer lateral systems are inspected and maintained properly and their residents are educated about proper grease disposal, thus reducing the potential for SSOs from these private systems.

#### *7.3.3 Pollution Control Ordinance*

Implementation and enforcement of City and County Pollution Control ordinances provides the legal mechanism to ensure correction of pollution problems and illegal practices. In addition, the ordinance serves as a deterrent to such practices, thus preventing pollution problems.

#### *7.3.4 Septic System Program*

The County maintains a septic system approval and inspection program to ensure proper design, installation, operation, and maintenance of these systems. The program is coordinated with the City and County NPDES MS4 programs to ensure that failing septic systems are addressed and that discharges from these systems are not reaching the MS4 or surface waters.

#### *7.3.5 Municipal Employee Education on IDDE*

As part of the City and County NPDES MS4 programs, municipal employees receive education on water quality and IDDE issues. This program provides the information necessary for employees to be trained to recognize and report IDDE and other water quality issues that may be discovered while performing their regular job duties in the field.

#### *7.3.6 Targeted Stream Investigation & Survey (TSIS)*

This program is implemented as a means to quickly assess field conditions and identify illicit discharges in priority stream basins. Priority basins are selected based on numerous factors, and personnel inspect outfalls, business corridors and multi-family private sewer systems within those basins. Personnel drive to select locations during base flow conditions and use visual observation, sensory cues, and quick field tests to determine if abnormal conditions exist. This method allows for numerous quick assessments that can be conducted more frequently throughout the year.

#### *7.3.7 Sewer Use Ordinance*

Implementation and enforcement of the City's Sewer Use ordinance provides the legal mechanism to ensure proper use and connection to the sanitary sewer system and correction of problems and illegal practices. Ensuring that the system is used properly will help prevent leaks and overflows as well as up-sets at wastewater treatment plants.

#### *7.3.8 Sanitary Sewer System Inspections and Maintenance*

The City's utility department conducts inspections and maintenance of various components of the sanitary sewer system to ensure proper operating function and prevent leaks and overflows. These include food service grease trap inspections, commercial oil/water separator inspections, sanitary sewer line root control and cleaning, sewer line right-of-way clearing and maintenance, and lift station inspection and maintenance.

#### *7.3.9 SSO Rapid Response*

The City's utility department maintains a rapid response program designed to quickly and efficiently respond to SSOs, thus reducing the discharge of pollutants to the MEP.

#### 7.4 Construction Site Stormwater Runoff Control

##### 7.4.1 *Erosion Control Ordinance*

Implementation and enforcement of City and County Soil Erosion and Sediment Control ordinances provides the legal mechanism to ensure proper design and construction of development sites by requiring the use of proper soil erosion and sediment control methods.

##### 7.4.2 *Structural SCM requirements*

City and County soil erosion and sediment control ordinances and programs require the use of structural stormwater control measures (SCMs), at a minimum, on development sites greater than or equal to one acre to prevent sediment from reaching the MS4 or surface waters.

##### 7.4.3 *Site Inspections*

City and County erosion control programs conduct routine inspections of development sites to ensure that structural BMPs are in place and operating properly.

#### 7.5 Post-Construction Stormwater Management

##### 7.5.1 *PCSO Ordinance*

Implementation and enforcement of City and County Post-Construction Stormwater ordinances provides the legal mechanism to ensure proper design, construction, operation, and maintenance of SCMs at development sites.

##### 7.5.2 *Require Structural SCMs*

City and County post-construction stormwater ordinances and programs require the use of structural SCMs on development sites greater than one acre to treat the stormwater runoff generated from the first one-inch of rainfall. In addition, structural SCMs must provide detention of the channel protection volume for Charlotte-Mecklenburg.

##### 7.5.3 *Buffer Requirements (PCSO, WSWS, SWIM)*

City and County post-construction stormwater ordinances and programs require the use and protection of vegetated buffers on development sites. The buffers assist with diffusing stormwater flows and stabilizing stream side zones.

##### 7.5.4 *SCM Inspection Program*

City and County post-construction stormwater programs require annual inspections of SCMs to ensure that the SCMs are operating and maintained properly.

## 7.6 Pollution Prevention/Good Housekeeping

### 7.6.1 *Facility Inspections*

The City and County conduct annual inspections of certain municipal facilities to ensure that they are implementing good housekeeping and stormwater pollution prevention practices. The process provides for the correction of any detected pollution problems and serves to reduce the discharge of stormwater pollutants to surface waters.

### 7.6.2 *Implementation of Site SWPPPs and SPRPs*

The City and County have identified certain municipal facilities as having the potential to discharge stormwater pollutants. Stormwater Pollution Prevention Plans (SWPPPs) and Spill Prevention Response Procedures (SPRPs) have been developed for these facilities in order to assist in reducing stormwater pollutant discharges and spills to the MS4 and surface waters.

### 7.6.3 *Catch basin cleaning*

The City conducts routine cleaning of catch basins and stormwater pipes in order to maintain the MS4, thus reducing blockages, street flooding, and discharges of pollutants to surface waters.

### 7.6.4 *Street sweeping*

The City conducts routine street sweeping of selected streets to remove sediments, debris, and litter from roadways and curb lines. This effort reduces that amount of material that ultimately would be washed to the MS4 during storm events, thus reducing the discharge of pollutants to the MS4 and surface waters.

## 7.7 Industrial Facilities Evaluation and Monitoring

### 7.7.1 *Facility Inspections and Monitoring*

The City conducts inspections and monitoring of selected industrial facilities to ensure that they are implementing good housekeeping and stormwater pollution prevention practices. The process provides for the correction of any detected pollution problems and serves to reduce the discharge of stormwater pollutants to surface waters.

## 7.8 Water Quality Assessment and Monitoring

### 7.8.1 *Fixed Interval Monitoring*

The City and County conduct fixed interval stream monitoring at identified stream sites on a quarterly basis, at a minimum. This monitoring is primarily used to determine water quality trends, but also is used as a tool to detect pollution problems in surface waters. Monitoring results that exceed threshold values are referred for follow-up under the IDDE program.

### 7.8.2 CMANN Monitoring

The City and County maintain a continuous automated monitoring network (CMANN) that monitors surface waters at select sites for turbidity, dissolved oxygen, temperature, conductivity, and pH. Monitoring results that exceed threshold values are referred for follow-up under the IDDE program.

## **Section 8: WQ Data Assessment**

Fixed interval surface water quality data collected from 2006 through 2016 have been analyzed for all applicable TMDL watersheds and pollutants of concern in the City and County. These data help to illustrate surface water quality trends in relation to the NC surface water quality standards. The City's current NPDES MS4 permit, effective March 1, 2013, states that the "MS4 Permittee is not responsible for attaining water quality standards (WQS) and the Division expects that attaining WQS will only be achieved through reduction of the TMDL pollutant of concern from the MS4, along with reductions from all other point and nonpoint source contributors." It is infeasible to monitor every MS4 stormwater outfall to determine how progress is being made toward achieving MS4 NPDES WLAs; therefore, the City will utilize fixed interval surface water data to investigate water quality trends. The data presented below, while illustrating how in-stream water quality has changed over time, unfortunately are not able to distinguish MS4 contributions from other point and nonpoint sources that are not under the control of the MS4. Consequently, increases in surface water contaminants observed in the data do not necessarily indicate that MS4 contributions are also increasing.

### 8.1 Fecal Coliform

Of the six watersheds listed in Table 2-1 that are subject to a fecal coliform TMDL, a MS4 NPDES WLA was only developed for McKee and Steele Creeks. According to Part II, Section J.3 of the City's NPDES MS4 permit, for approved TMDLs where a MS4 NPDES WLA for the pollutant of concern is not assigned to the municipal stormwater system, the Permittee is still required to "evaluate strategies and tailor BMPs within the scope of the six minimum permit measures to address the pollutant of concern in the watershed(s) to which the TMDL applies." For this reason, data from all six watersheds listed as being subject to fecal coliform TMDLs in Table 2-1 will be discussed in this sub-section.

#### *8.1.1 McKee Creek*

Fixed interval stream data for fecal coliform was collected at the Charlotte-Mecklenburg monitoring site MY7B on McKee Creek. A summary of the data collected from January 2007 through July 2016 is provided in Figures 8-1. One hundred and thirty one (131) samples were collected during this period and 68 samples (52% of the total) exceeded the 400 cfu/100mL State standard. Of these 131 samples, 53 were collected during ambient conditions (meaning a 72-hour or greater period with no precipitation prior to sampling event) and 78 were collected during wet weather influenced conditions. The majority (63%) of the State standard exceedances occurred during wet weather conditions, but with 36% of ambient samples exceeding State



standards, fecal coliform exceedances continue to occur in McKee Creek during wet weather influenced and ambient conditions.

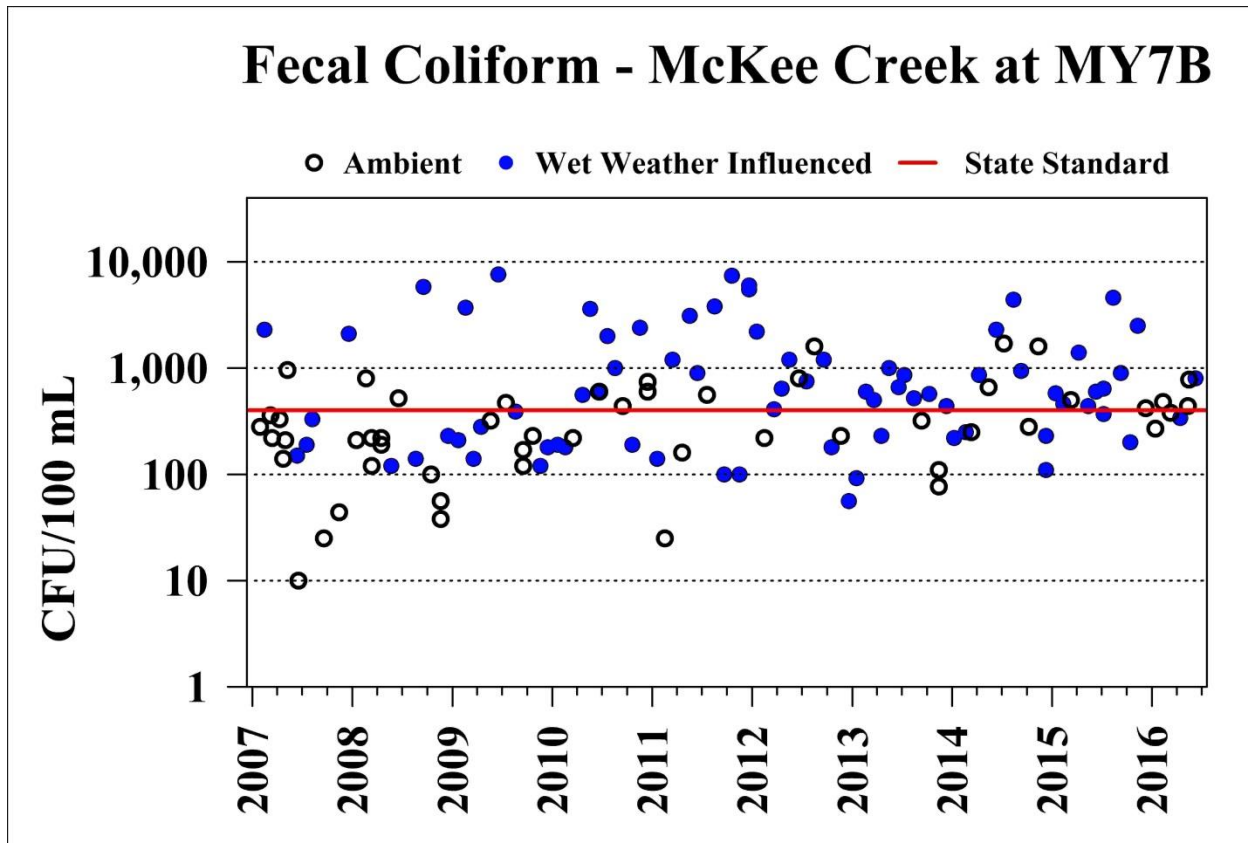


Figure 8-1: McKee Creek –MY7B - Overall Monitoring Data

### 8.1.2 Steele Creek Watershed

Fixed interval stream data for fecal coliform were collected at the Charlotte-Mecklenburg monitoring site MC47A on Steele Creek. A summary of the data collected from July 2007 through July 2016 is provided in **Figure 8-2**. One hundred and forty eight (148) samples were collected during this period and 51% of the samples exceeded the 400 cfu/100mL State standard. Of these 148 samples, 64 were collected during ambient conditions and 80 were collected during wet weather influenced conditions. (An additional four events were not marked as storm vs ambient.) For the samples collected during ambient conditions, 22% of samples exceeded the State standard over the period shown in **Figure 8-2**. For samples collected during wet weather influenced conditions, fecal coliform levels exceeded the standard at a greater rate (74%).

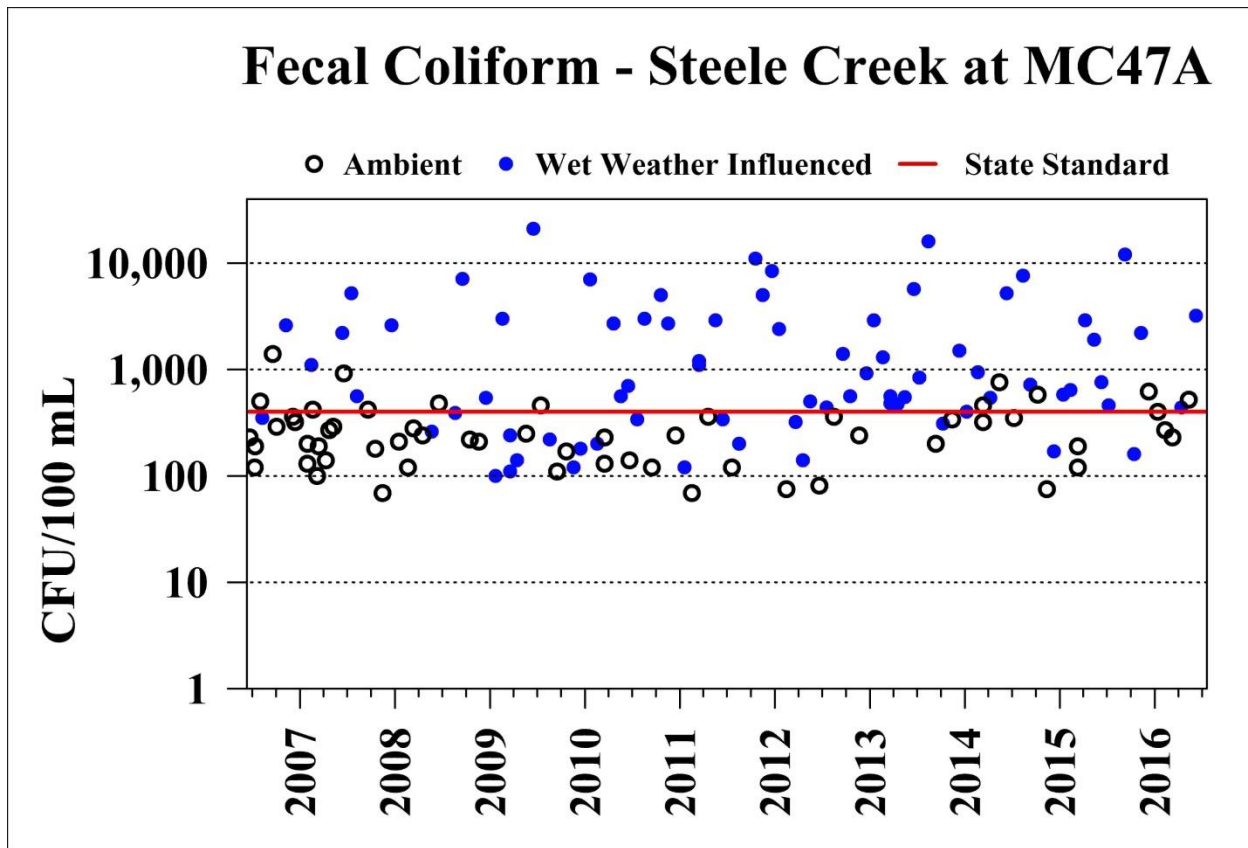


Figure 8-2: Steele Creek –MC47A - Overall Monitoring Data

#### 8.1.3 Sugar/Irwin Creek Watershed

There are two fixed interval monitoring locations in the Sugar Creek watershed, MC27 in southern Mecklenburg County, and MC22A on Irwin Creek just before its confluence with Sugar Creek. An assessment of available watershed and water quality data was conducted utilizing fixed interval stream data for fecal coliform collected at these two monitoring locations. A summary of the data collected from July 2007 through July 2016 is provided in **Figures 8-3 and 8-4**.

One hundred and forty eight (148) samples were collected during this period from Sugar Creek and 43% of the samples exceeded the 400 cfu/100mL State standard (**Figure 8-3**). Of these 148 samples, 62 were collected during ambient conditions and 82 were collected during wet weather influenced conditions. (An additional four events were not marked as storm vs ambient.) Among wet weather influenced samples, the rate of exceedances was 67%, compared to a rate of 11% among ambient samples.

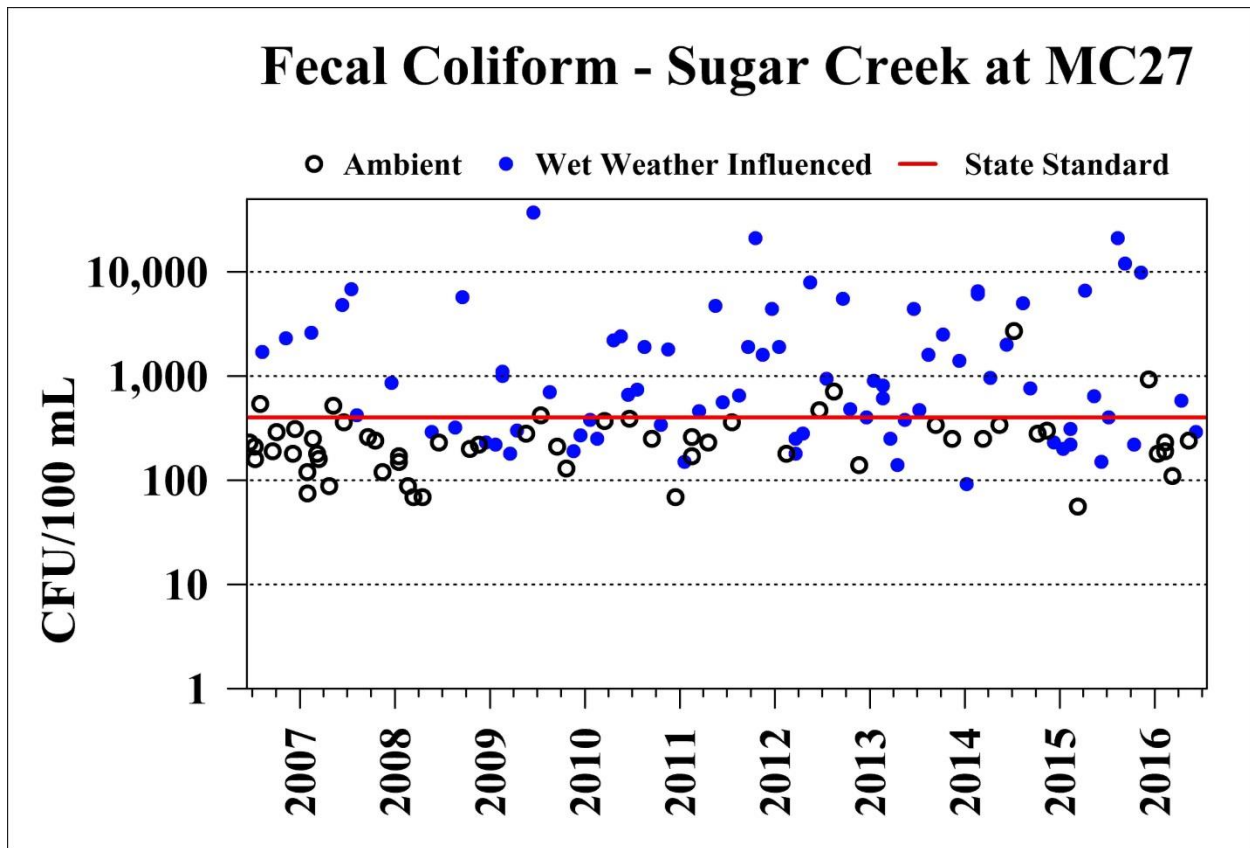


Figure 8-3: Sugar Creek –MC27 - Overall Monitoring Data

During the same period, 151 fixed interval samples were collected from the Irwin Creek site with 50% of these samples exceeding the 400 cfu/100mL fecal coliform State standard (**Figure 8-4**). Of these 151 samples, 66 were collected during ambient conditions and 81 were collected during wet weather influenced conditions. (An additional four events were not marked as storm vs ambient.) Of these, 29% of the samples collected in ambient conditions and 69% of the samples collected in wet weather influenced conditions exceeded the State standard. Fecal coliform exceedances continue to occur during both sampling conditions; however, since 2008 there has been a decrease in the frequency of exceedances during ambient conditions compared to 2006-2007 (**Figure 8-4**).

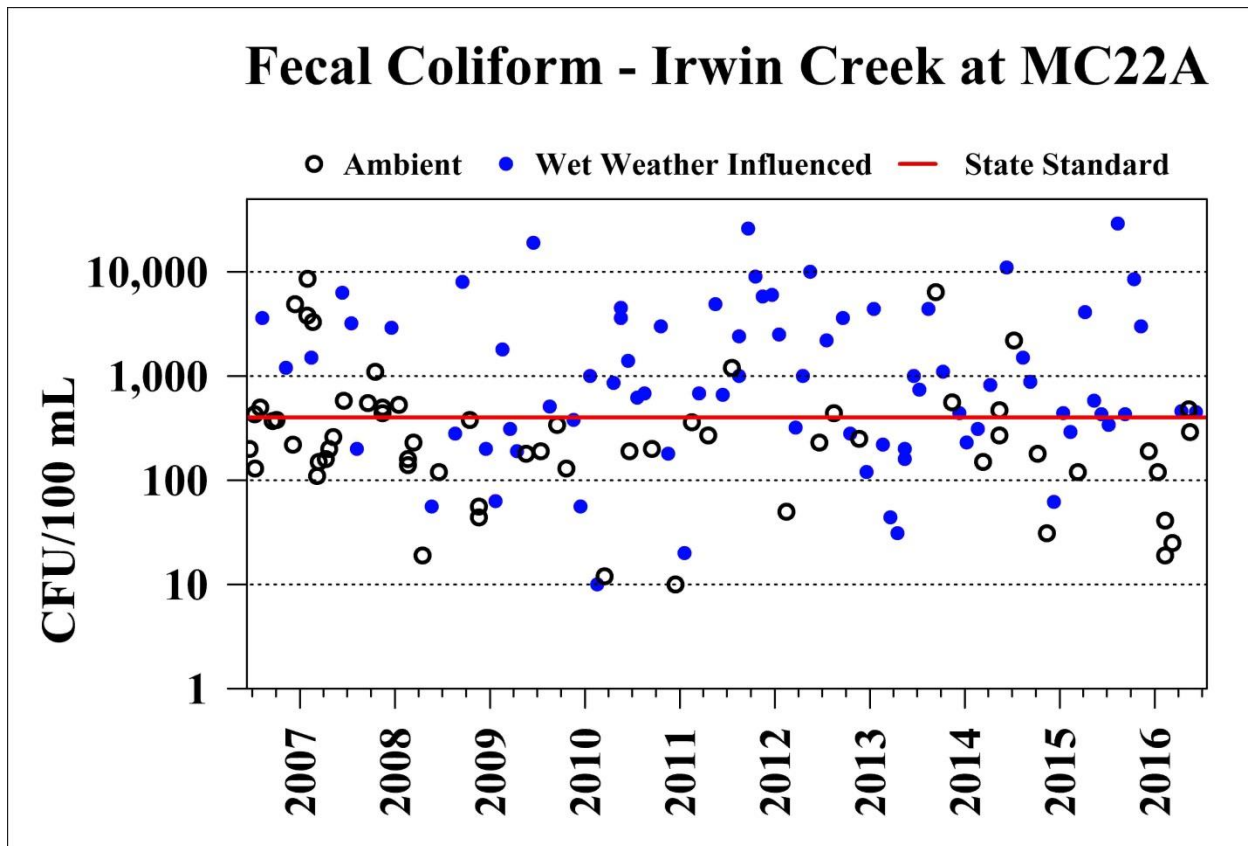


Figure 8-4: Irwin Creek –MC22A - Overall Monitoring Data

#### 8.1.4 Little Sugar Creek Watershed

There are two monitoring locations on Little Sugar Creek, MC49A in southern Mecklenburg County, and MC29A-1 just downstream of downtown Charlotte. An initial assessment of available watershed and water quality data was conducted utilizing fixed interval stream data for fecal coliform collected at these two monitoring locations. A summary of the data collected from July 2007 through July 2016 is provided in **Figures 8-5 and 8-6**. For monitoring site MC49A, 148 samples were collected during this period with 53% of the samples exceeding the 400 cfu/100mL State standard for fecal coliform. Of these 148 samples, 61 were collected during ambient conditions and 83 were collected during wet weather influenced conditions. Laboratory analysis data from samples collected during ambient conditions showed that the fecal coliform standard was exceeded 25% of the time, while 76% of wet weather influenced samples exceeded the standard.

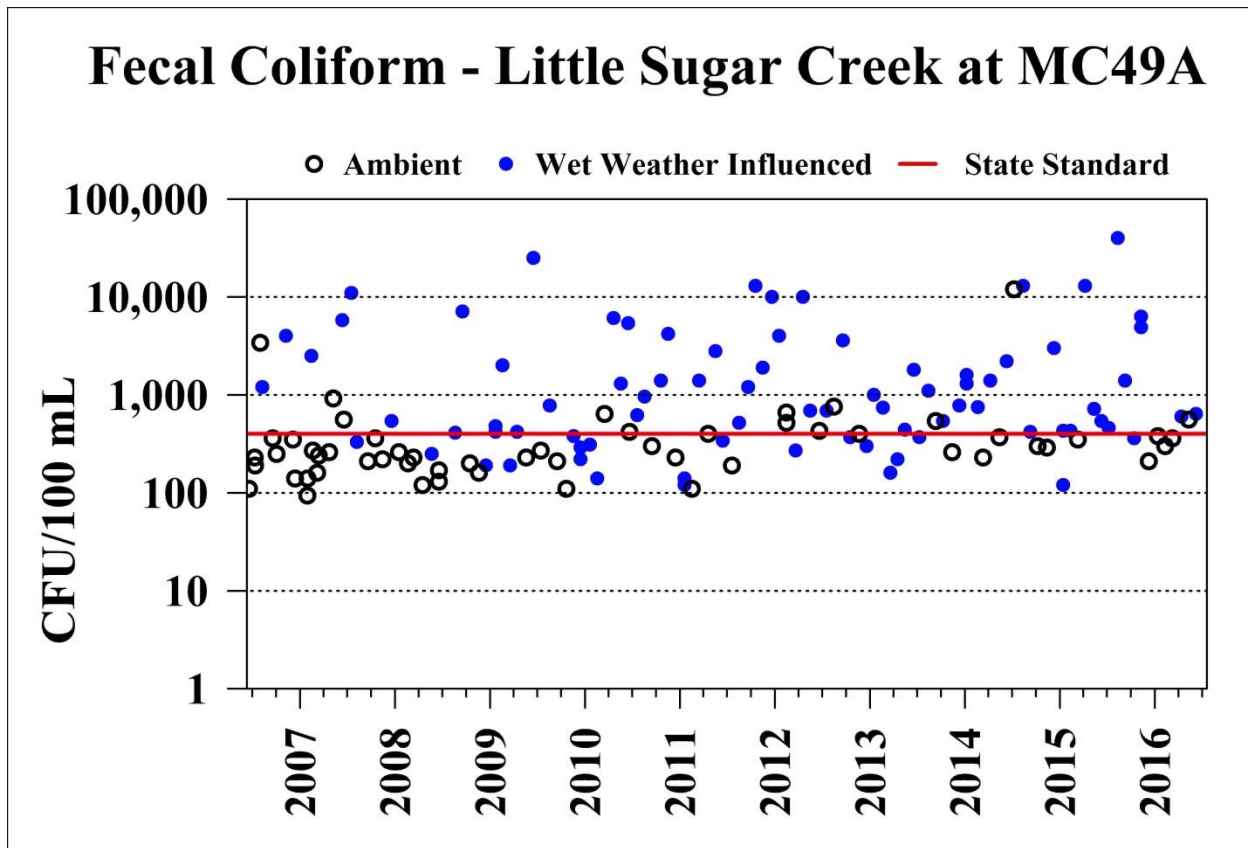


Figure 8-5: Little Sugar Creek –MC49A - Overall Monitoring Data

For monitoring site MC29A-1, 146 samples were collected during this period with 84% of the samples exceeding the 400 cfu/100mL State standard for fecal coliform (**Figure 8-16**). Of these 146 samples, 59 were collected during ambient conditions and 81 were collected during wet weather influenced conditions (**Figure 8-6**). Of the samples collected during ambient conditions, 71% exceeded the State standard and of the samples collected during wet weather influenced monitoring, 94% exceeded the standard. Exceedances of the fecal coliform standard at MC29A-1 were more prevalent and of greater magnitude than exceedances observed at MC49A.

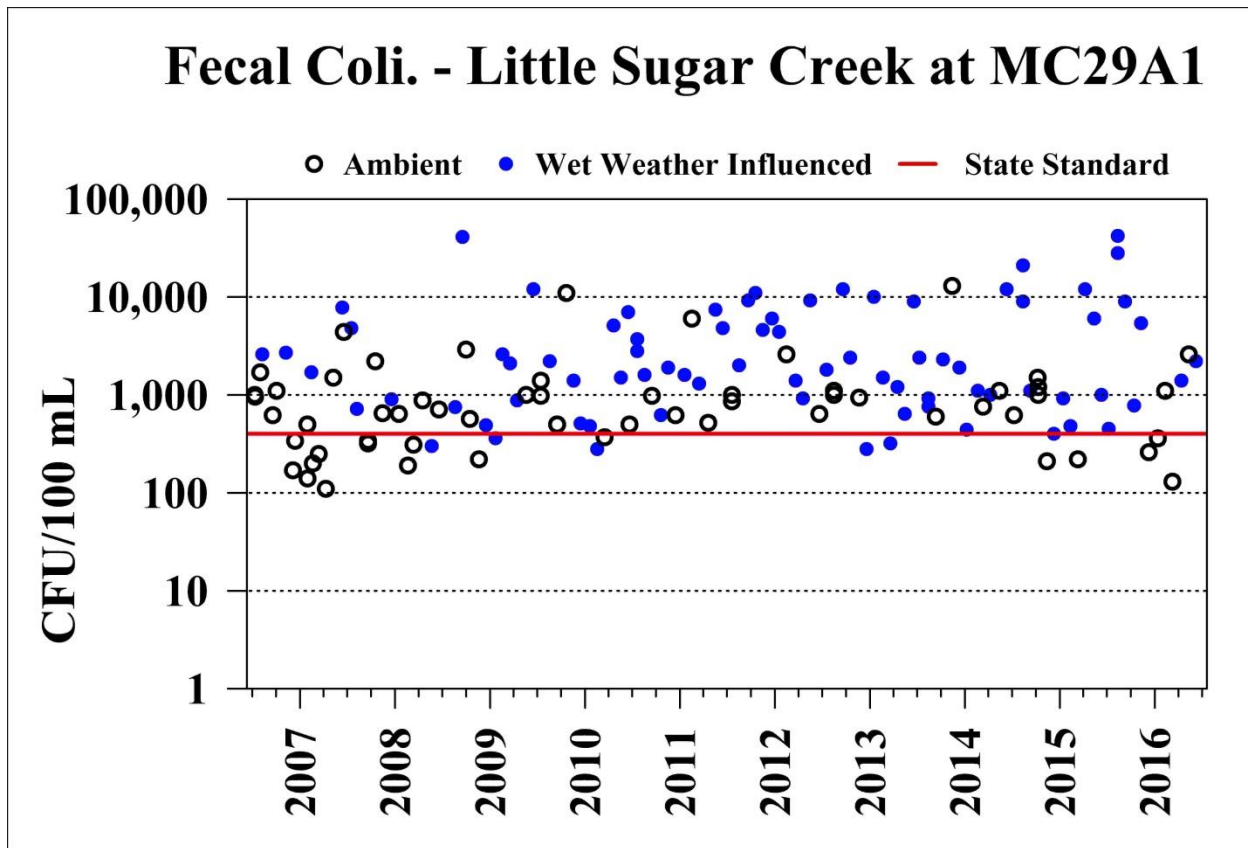


Figure 8-6: Little Sugar Creek –MC29A-1 - Overall Monitoring Data

#### 8.1.5 McAlpine Creek Watershed

There are two monitoring locations on McAlpine Creek, MC45B just downstream of the NC/SC border, and MC38 downstream of the confluence with Campbell Creek and Irvins Creek. An initial assessment of available watershed and water quality data was conducted utilizing fixed interval stream data for fecal coliform collected at these two monitoring locations. A summary of the data collected from July 2007 through July 2016 is provided in **Figures 8-7 and 8-8**. One hundred and forty seven (147) samples were collected during this period from MC45B and 31% of the samples exceeded the 400 cfu/100mL State standard. Of these 147 samples, 61 were collected during ambient conditions and 79 were collected during wet weather influenced conditions. Only 7%, or four out of 61, of the ambient samples exceeded the State standard.



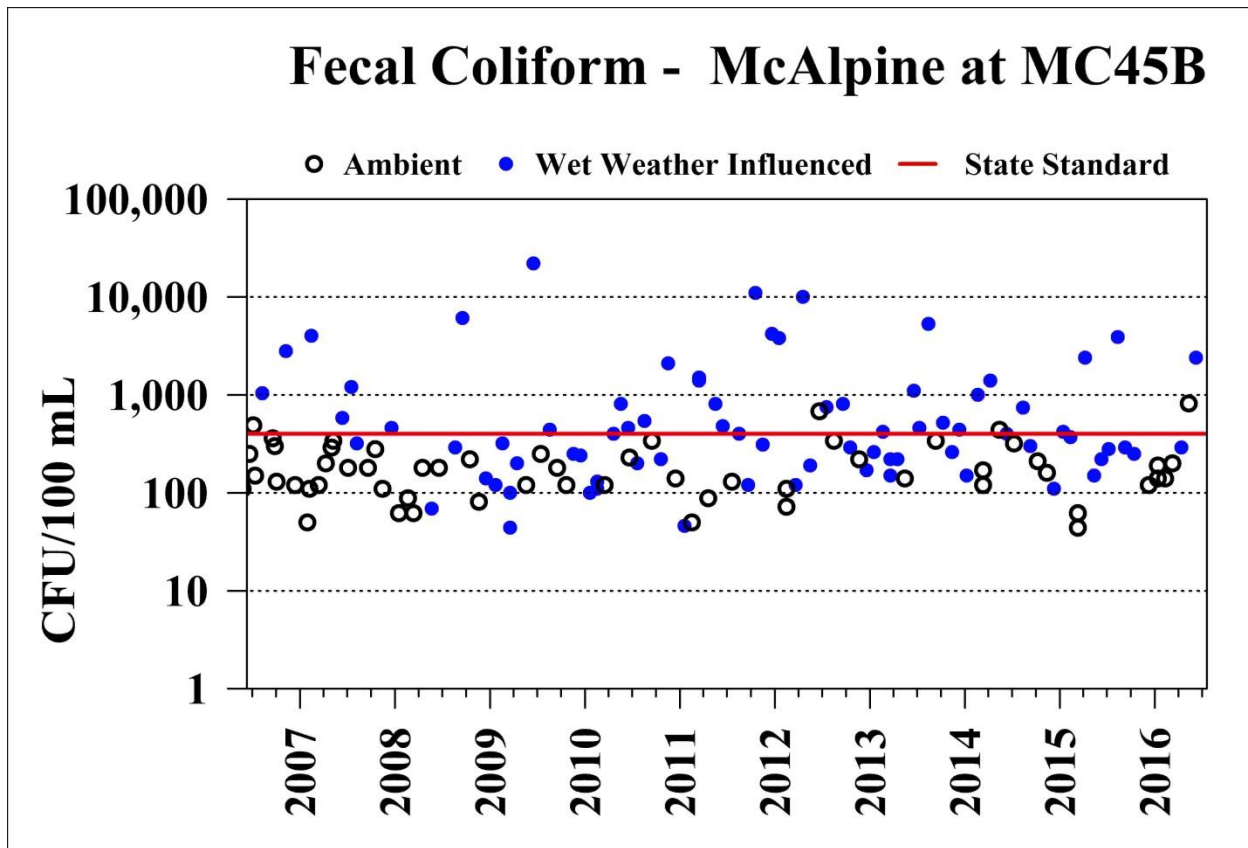


Figure 8-7: McAlpine Creek –MC45B - Overall Monitoring Data

One hundred and forty nine (149) samples were collected during this period from McAlpine Creek at MC38 and 50% of the samples exceeded the 400 cfu/100mL State standard for fecal coliform (**Figure 8-8**). Of these 147 samples, 59 were collected during ambient conditions and 83 were collected during wet weather influenced conditions. Of the samples collected during ambient conditions, 17% exceeded the State standard, and of the samples collected during wet weather influenced monitoring, 76% exceeded the standard.

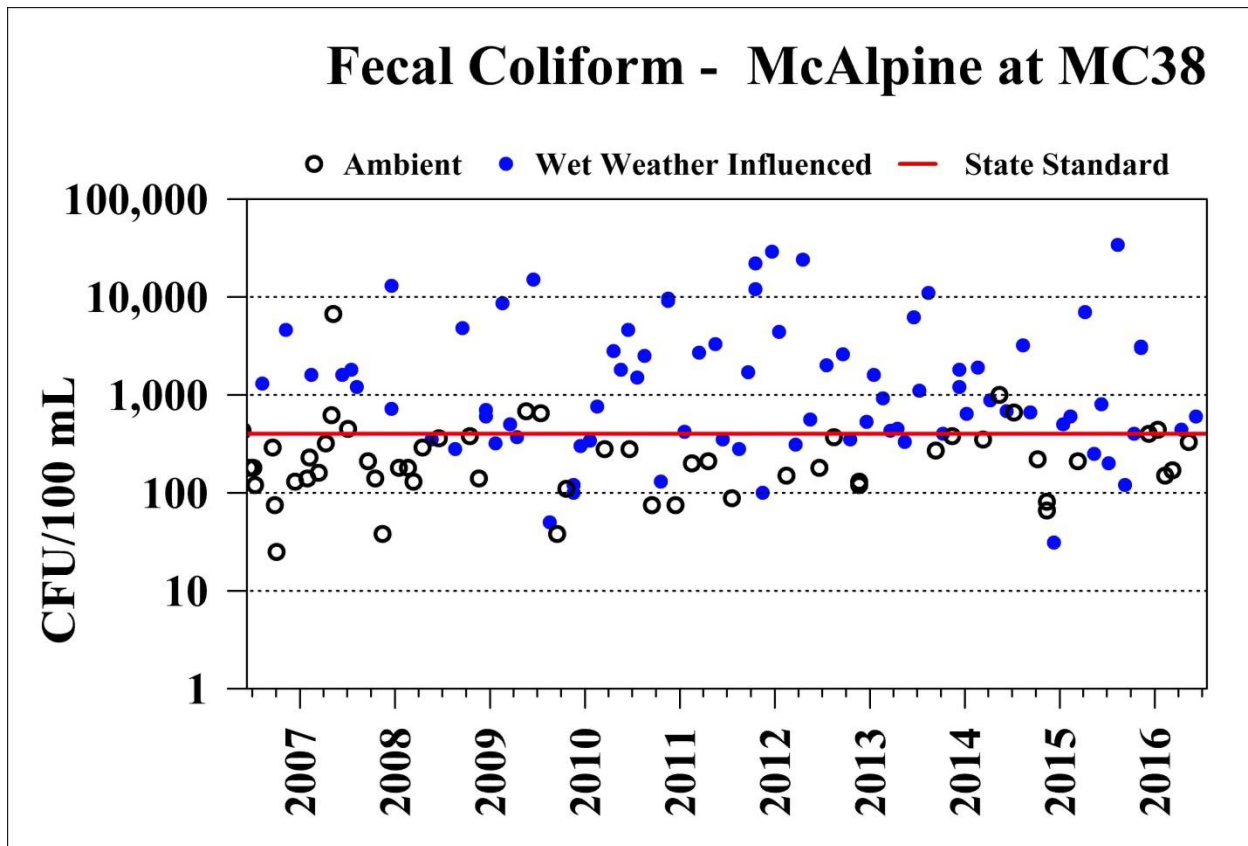


Figure 8-8: McAlpine Creek –MC38 - Overall Monitoring Data

#### 8.1.6 *Fecal Coliform Summary*

The State standard for fecal coliform is exceeded by more than 10% for all watersheds with a fecal coliform TMDL identified above, based on fixed interval data collected between 2006 and 2016. These exceedances are more common in wet weather influenced conditions but samples collected during ambient conditions also exceed the standard by more than 10%, with the exception of McAlpine Creek at monitoring point MC45B, where only 7% of samples collected in ambient conditions exceed the standard.

### 8.2 Turbidity

As discussed in sub-section 2.2, the turbidity TMDL developed in 2005 included five Charlotte-Mecklenburg watersheds but only developed a WLA for turbidity for Long Creek since the water quality data assessment performed for the TMDL demonstrated that the remaining four watersheds had less than a 10% exceedance rate of the 50 NTU State standard. Therefore, this sub-section includes an assessment of turbidity data only for Long Creek.

### 8.2.1 Long Creek Watershed

An initial assessment of available watershed and water quality data was conducted utilizing stream data for turbidity collected at the Charlotte-Mecklenburg monitoring site MC14A on Long Creek. A summary of the data collected from July 2006 through July 2016 is provided in **Figure 8-9**. One hundred and thirty two (132) samples were collected during this period and 28 samples exceeded the 50 NTU State standard. Of these 132 samples, 49 were collected during ambient conditions and 83 were collected during wet weather influenced conditions. There have been no exceedances of the State standard during ambient conditions during this period.

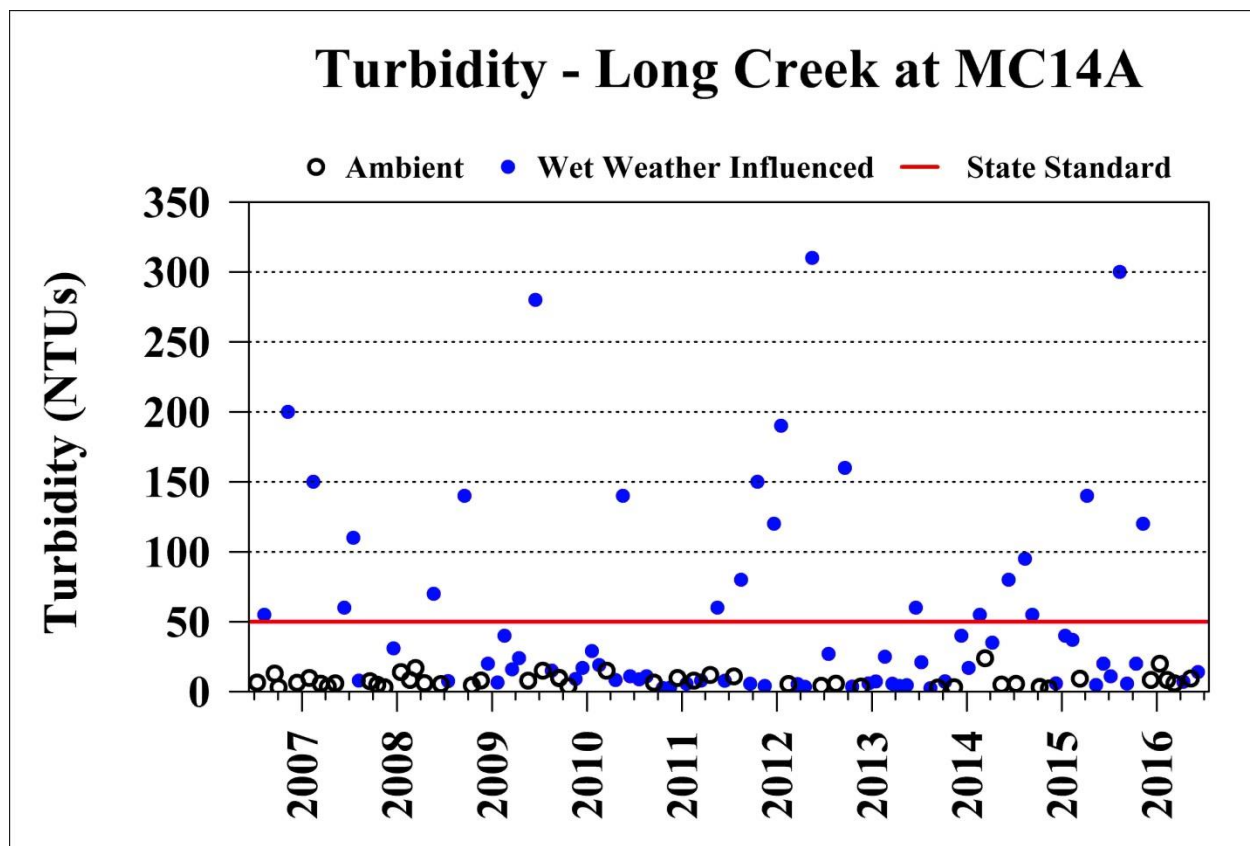


Figure 8-9: Long Creek –MC14A - Overall Monitoring Data

### 8.3 Dissolved Oxygen

As stated in sub-section 2.3, the 1996 dissolved oxygen (DO) TMDL for Irwin Creek, McAlpine Creek, and Little Sugar Creek did not include a MS4 NPDES WLA. Nevertheless, since the City’s NPDES MS4 permit states in Part II, Section J.3, for approved TMDLs where a MS4 NPDES WLA for the pollutant of concern is not assigned to the MS4, the Permittee is still required to “evaluate strategies and tailor BMPs within the scope of the six minimum permit measures to address the pollutant of concern in the watershed(s) to which the TMDL applies.” For this reason, the dissolved oxygen data is provided below in **Figures 8-10 through 8-14**.

Unlike the other parameters, for dissolved oxygen the State standard is violated when concentrations go below the standard rather than exceeding the standard. Based on the fixed interval sampling conducted between July 2006 and July 2016, there have been no violations of the State standard of 4 mg/L in any of the DO TMDL watersheds. The 2012 NC Integrated Report categorizes each of these watersheds as 1t for DO, meaning that they have a TMDL but are not impaired and are supporting their designated uses.

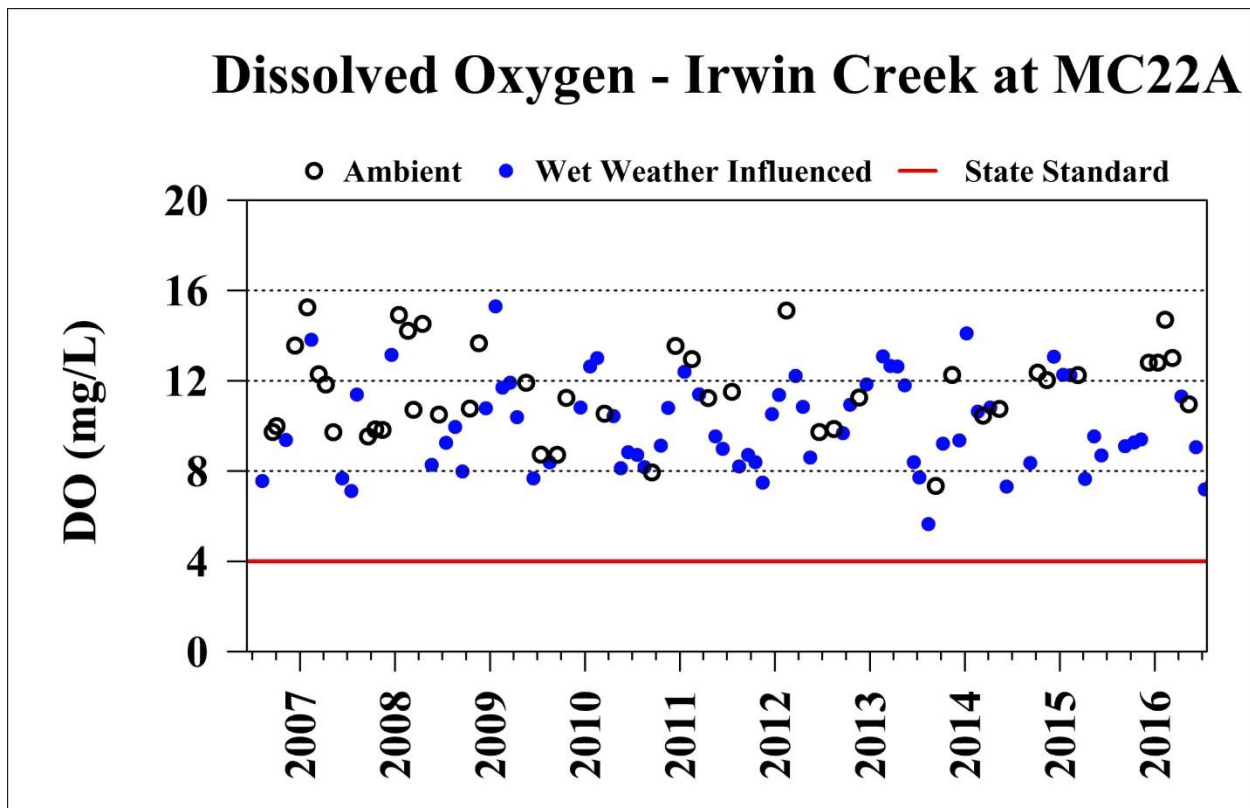


Figure 8-10: Irwin Creek–MC22A - Overall Monitoring Data

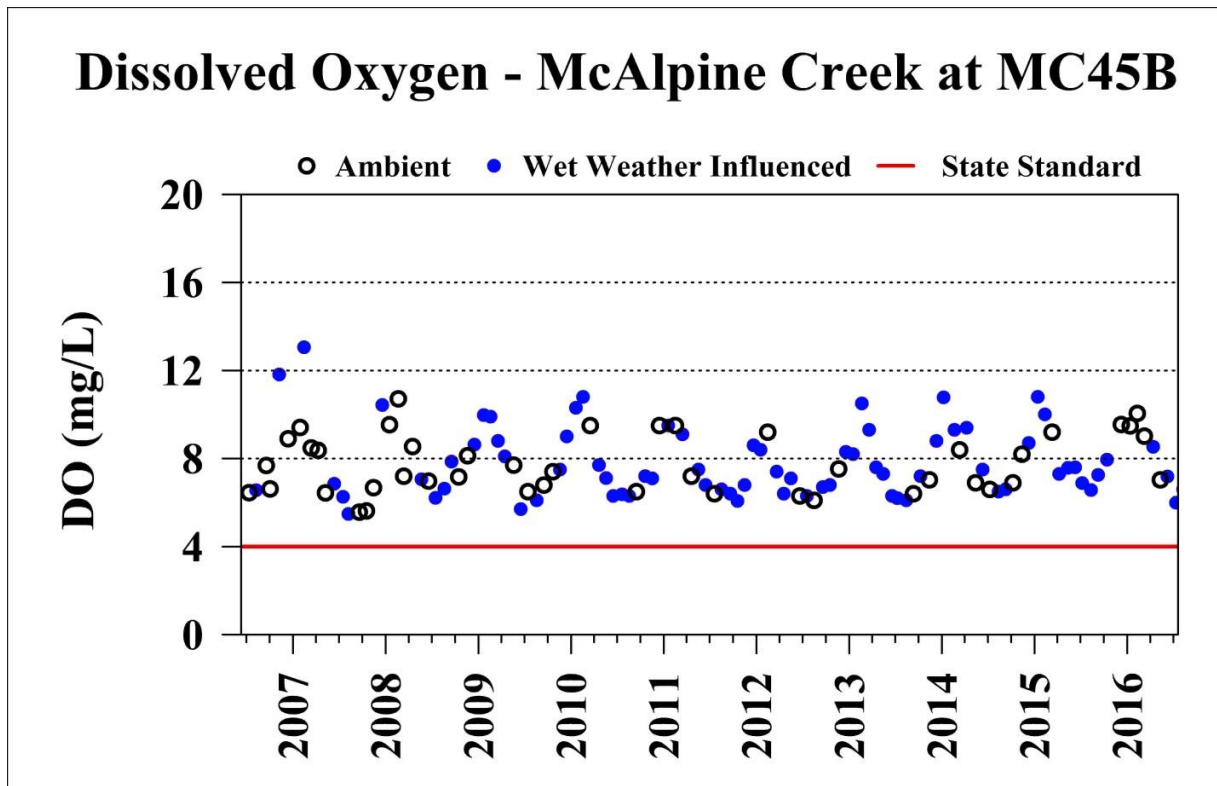


Figure 8-11: McAlpine Creek –MC45B - Overall Monitoring Data

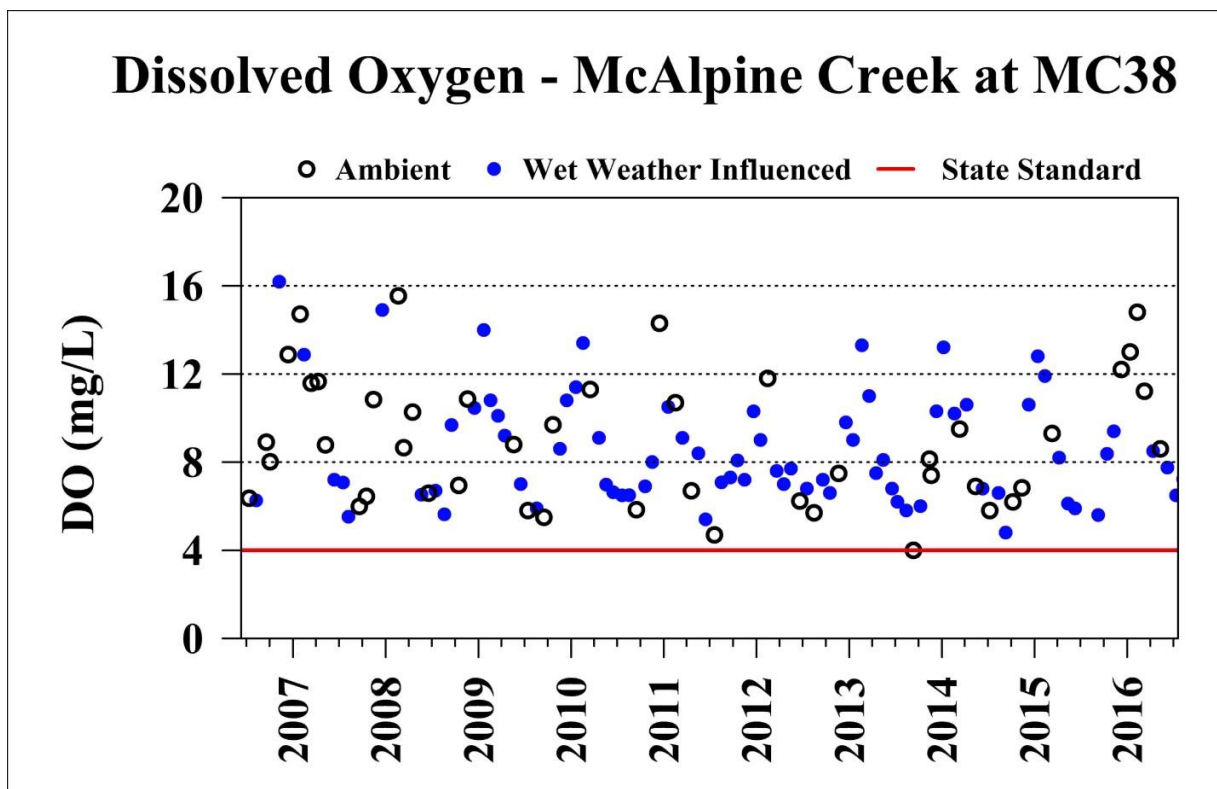


Figure 8-12: McAlpine Creek –MC38 - Overall Monitoring Data

## Dissolved Oxygen - Little Sugar Creek at MC49A

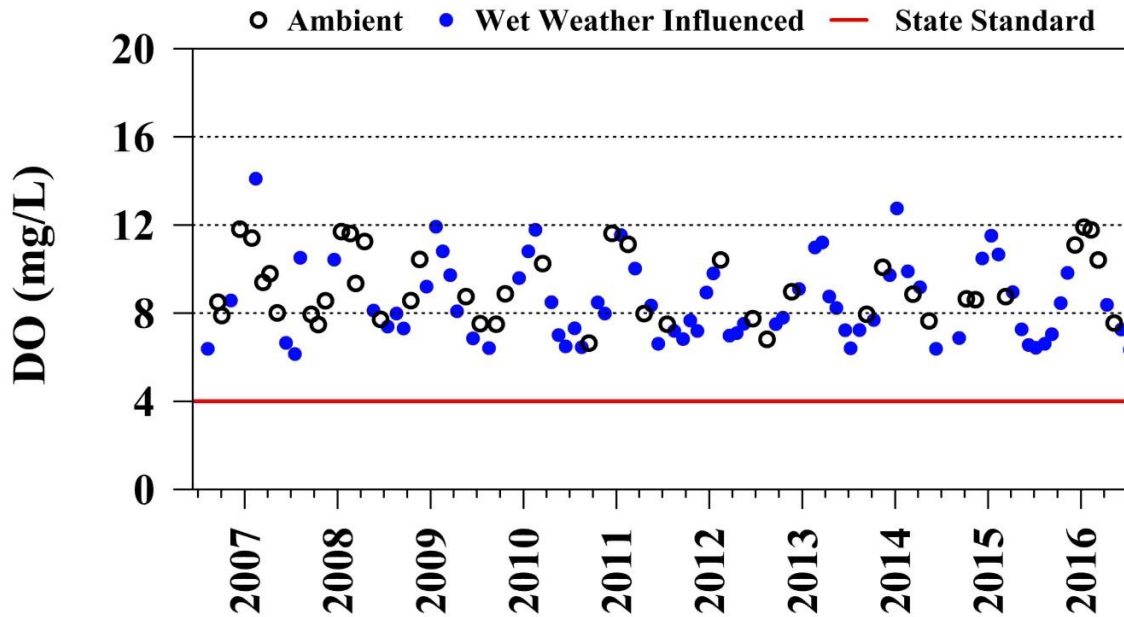


Figure 8-13: Little Sugar Creek –MC49A - Overall Monitoring Data

## Dissolved Oxygen - Little Sugar Creek at MC29A1

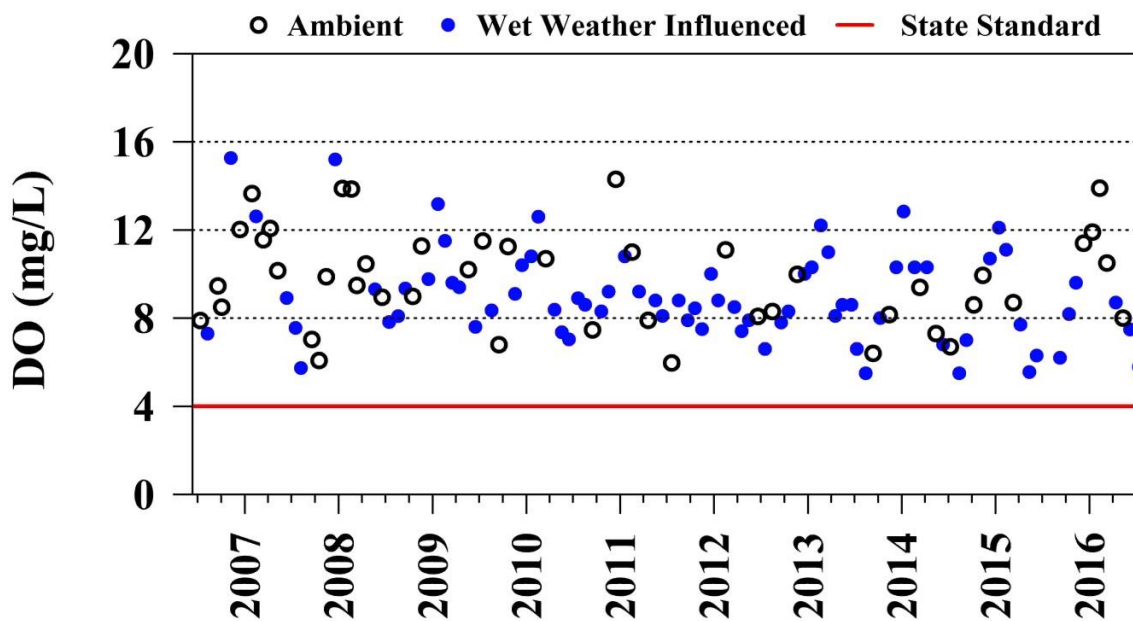


Figure 8-14: Little Sugar Creek –MC29A-1 – Overall Monitoring Data



#### 8.4 Chlorophyll a

As stated in sub-section 2.4, Mecklenburg County is responsible for providing annual assessment reports for the Lake Wylie chlorophyll a TMDL under their Phase II NPDES permit.

#### 8.5 Mercury

As stated in sub-section 2.5, the State did not consider it necessary to include an MS4 NPDES WLA for mercury in their statewide TMDL. For this reason, mercury data is not analyzed in this TMDL Watershed Plan.

### **Section 9: Monitoring Plan**

The monitoring plan for the TMDL watersheds was developed during January and February 2016 as required by the NPDES MS4 permit schedule. The monitoring plan is shown in **Appendix B**.

### **Section 10: Additional BMP Measures**

Section 7 of this plan discusses the existing BMP measures that are designed to address the TMDL pollutants of concern. Currently the City & County implement a multi-faceted program addressing these pollutants of concern that utilizes 37 different BMPs. During FY2016, other potential BMPs were reviewed and the following BMPs are included as additional BMP measures designed to reduce the TMDL pollutants of concern and to achieve the MS4 NPDES WLA to the maximum extent practicable (MEP).

- Yard waste collection – provide curbside yard waste collection services for City residents for the collection of leaves, grass clippings, and woody debris.
- Street ROW litter removal – provide litter and debris pick-up by City staff along street ROW and medians on a rotating schedule.
- Dead animal removal – provide dead animal pick-up by City staff on streets and along street ROW and medians as needed.

These BMPs are designed to further reduce fecal coliform and sediment that may be contributed from the sources discussed above.

### **Section 11: Implementation Plan for Additional BMP Measures**

This section will be addressed in future TMDL plan revisions as required by the NPDES MS4 permit schedule. This activity is scheduled to be completed by February 28, 2017.

### **Section 12: Data Tracking and Assessment**

The City and County will track relevant water quality monitoring and BMP measure implementation data for the activities conducted under the TMDL Watershed Plan throughout

each fiscal year beginning with FY2017 (July 2016 – June 2017). This is for the purpose of tracking data trends relative to achieving the MS4 NPDES regulated WLA and reducing the TMDL pollutants of concern to the MEP. An assessment of the water quality monitoring data collected during FY2016 is shown the data graphs in Section 8.

### **Section 13: Reporting**

As part of the NPDES MS4 annual report process, data and information concerning the TMDL Watershed Plan will be submitted discussing program activities and successes implemented toward achieving the MS4 NPDES WLA and reducing the TMDL pollutant of concern to the MEP within the applicable TMDL watersheds.

## REFERENCES

1. NCDENR - Division of Water Quality, January 2005. Total Maximum Daily Loads (TMDLs) for Turbidity in Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork, and Mud Creek in North Carolina

Rosgen. D.L., A Practical Method of Computing Streambank Erosion Rate. Wildland Hydrology, Inc. Pagosa Springs, Colorado. Online at:

[http://www.wildlandhydrology.com/assets/Streambank\\_erosion\\_paper.pdf](http://www.wildlandhydrology.com/assets/Streambank_erosion_paper.pdf)

United States. Environmental Protection Agency (USEPA). October 1999. Protocols for Developing Sediment TMDLs – First Edition. EPA 841-B-99-004. Washington, DC.

United States Environmental Protection Agency (USEPA). 2000. Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water Quality Planning and management Regulation; Final Rule. Fed. Reg. 65:43586-43670 (July 13, 2000).

2. NCDENR - Division of Water Quality, June 2003. Fecal Coliform Total Maximum Daily Load for the McKee and Clear Creek Watersheds, Mecklenburg and Cabarrus Counties, North Carolina.

NCDENR - Division of Water Quality, January 2005. Total Maximum Daily Loads (TMDLs) for Turbidity in Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork, and Mud Creek in North Carolina

United States. Environmental Protection Agency (USEPA). October 1999. Protocols for Developing Sediment TMDLs – First Edition. EPA 841-B-99-004. Washington, DC.

United States Environmental Protection Agency (USEPA). 2000. Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water Quality Planning and management Regulation; Final Rule. Fed. Reg. 65:43586-43670 (July 13, 2000).

3. NCDENR - Division of Water Quality, June 2003. Fecal Coliform Total Maximum Daily Load for the McKee and Clear Creek Watersheds, Mecklenburg and Cabarrus Counties, North Carolina.

NCDENR - Division of Water Quality, January 2005. Total Maximum Daily Loads (TMDLs) for Turbidity in Long Creek, McAlpine Creek, Sugar Creek, Little Sugar Creek, Irwin Creek, Henry Fork, and Mud Creek in North Carolina

United States. Environmental Protection Agency (USEPA). October 1999. Protocols for Developing Sediment TMDLs – First Edition. EPA 841-B-99-004. Washington, DC.

United States Environmental Protection Agency (USEPA). 2000. Revisions to the Water Quality Planning and Management Regulation and Revisions to the National Pollutant Discharge Elimination System Program in Support of Revisions to the Water Quality Planning and management Regulation; Final Rule. Fed. Reg. 65:43586-43670 (July 13, 2000).

4. SCDHEC – Bureau of Water, May 2007. Total Maximum Daily Load – Steele Creek (Hydrologic Unit Code 030501030108) Stations CW-009, CW-011, CW-203 - Fecal Coliform Bacteria

## APPENDIX B

### Charlotte-Mecklenburg TMDL Watershed Monitoring Plan

#### **Section 1: Purpose**

The purpose of this monitoring plan is to meet the requirements of the City of Charlotte and Mecklenburg County NPDES MS4 permit programs which require the development of a TMDL watershed plan and associated monitoring plan within the City of Charlotte and associated Mecklenburg County jurisdictions. Information gained from the monitoring conducted under this plan can be used to conduct water quality assessment activities aimed at determining short-term and long-term trends, and identifying significant sources of the pollutant of concern related to the MS4 NPDES regulated waste load allocation (WLA). In addition, the information can be used for evaluating the performance of BMPs utilized in the TMDL plan, where possible; and for assessing progress toward the goals of the plan at the TMDL identified monitoring points.

#### **Section 2: TMDL Watershed Monitoring Program**

##### **2.1 Monitoring Methods**

Monitoring methods utilized in this plan will consist of directly accessing the stream to conduct specified monitoring within the stream channel at a point representative of the overall stream flow at the time of monitoring. In most cases, this will be center channel of the stream. When possible, staff will enter the stream and directly fill sample bottles from the stream flow. Monitoring will also follow the procedures set forth in the Charlotte-Mecklenburg QAPP.

##### **2.2 Sample Types and Frequency**

Samples collected under this plan will be fixed interval grab samples taken, at a minimum, on a quarterly basis at each monitoring location. A specific day of each calendar quarter (specifically, the 2<sup>nd</sup> Wednesday of the first month of each calendar quarter) will be assigned for monitoring to allow for sampling over a range of flows and seasonal variability over the long-term at each monitoring location.

##### **2.3 Monitoring Parameters**

**Table 2-1** provides a list of the water quality parameters sampled at applicable monitoring sites.

**Table 2-1: Water Quality Monitoring Parameters.**

Parameter	Sample Type	Frequency
Fecal Coliform	Grab	Quarterly
Total Suspended Solids	Grab	Quarterly
Turbidity	Grab	Quarterly
Dissolved Oxygen	Grab	Quarterly

### **Section 3: Monitoring Sites**

#### **3.1 Basis for Locating Monitoring Sites**

The goal of the TMDL watershed monitoring plan is to locate at least one monitoring site within each of the TMDL watersheds to characterize water quality conditions for the applicable pollutant of concern within the watershed. Sites are located at the downstream most accessible point within the watershed. Where possible, sites are located at the TMDL compliance point(s) as identified in each applicable TMDL document.

#### **3.2 Site Locations/Description**

**Table 3-1** contains a description and location of the monitoring sites within the monitoring plan.

**Table 3-1:** Description of TMDL Watershed Monitoring Sites.

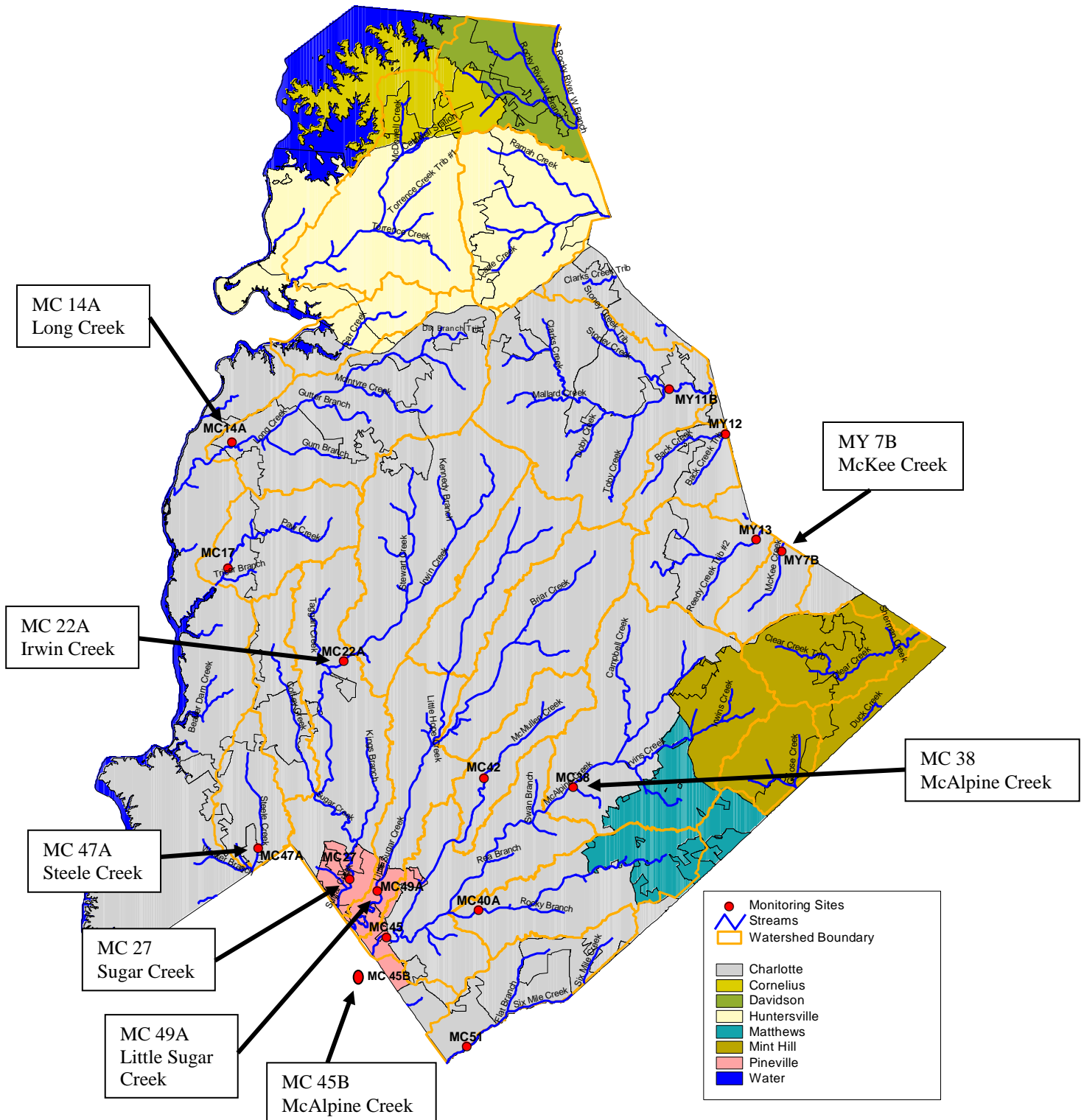
<b>Site #</b>	<b>Stream</b>	<b>Location</b>
MY7B	McKee Creek	Reedy Creek Rd. bridge, south of Harrisburg Rd.
MC14A	Long Creek	Pine Island Dr. at End of Street at Golf Course
MC47A	Steele Creek	Carowinds Blvd. bridge
MC22A	Irwin Creek	Westmont Dr. bridge, at Irwin Creek WWTP
MC27	Sugar Creek	Hwy. 51 bridge, east of Downs Rd.
MC49A	Little Sugar Creek	Hwy. 51 bridge, west of Carolina Place Mall
MC38	McAlpine Creek	Sardis Rd. bridge, between Sardis Ln. & Sardis Rd. N.
MC45B	McAlpine Creek	Harrisburg Rd. bridge, in South Carolina

#### **3.3 Site Map**

**Figure 3-1** shows a map and location of the TMDL watershed monitoring sites.



**Figure 3-1:  
TMDL Watershed Monitoring Sites**



## **Section 4: Sample and Data Analysis**

### **4.1 Sample Analytical Methods**

**Table 4-1** shows the monitoring parameters, reporting limits and analytical methods used to analyze samples collected under the plan.

**Table 4-1:** Charlotte Water Laboratory Analytical Methods and Minimum Reporting Levels (RLs)

<b>Parameter</b>	<b>Reporting Limit</b>	<b>Units</b>	<b>Analytical Method</b>
Fecal Coliform	1.00	CFU/100 ml	SM 9222-D
Total Suspended Solids	1.00	mg/L	SM 2540-D
Turbidity	0.05	NTU	SM 2130-B
Dissolved Oxygen	N/A	N/A	N/A

### **4.2 Quality Assurance**

Staff of Charlotte-Mecklenburg Stormwater Services will conduct the monitoring and sample collection activities under this plan. The Charlotte Water laboratory will analyze the water quality monitoring samples. Charlotte-Mecklenburg Stormwater Services has developed a Quality Assurance Project Plan (QAPP) which details sampling protocols and procedures; including sample handling, preservation, transportation, equipment calibration and maintenance, laboratory protocols, QA/QC, field blanks, and trip blanks. The QAPP has been approved by NCDEQ DWR. Charlotte-Mecklenburg Stormwater Services is certified for field analyses and is registered with the State of North Carolina under certification No. 5235. The Charlotte Water maintains laboratory certification No. 192.

### **4.3 Record Keeping**

All records and data generated under the monitoring plan will be maintained for a minimum period of five (5) years as required by the NPDES MS4 permit. In most cases, applicable field data and laboratory data are stored in electronic format. Hard copy field notes, log books, calibration records, and bench sheets are also maintained.

## **Section 5: Data Evaluation and Assessment**

Data will be evaluated and assessed as discussed in Sections 8 and 12 of the overall TMDL watershed plan.